

# AVIATION WEEK

SEPT. 8, 1952

50 CENTS

A MCGRAW-HILL PUBLICATION



## Today, Guardian Angels Fly an ALBATROSS

Meet two guardian angels on the wing. Ahead, in the night, lives will be saved. Perhaps the survivors of a capsized sailboat on an inland lake, or a bomber crew downed on a hostile shore, or critically injured seamen on a tanker far at sea. Such are the missions performed in every corner of the globe by Air Rescue Crews of the Air Force. The big amphibian they fly is the versatile and rugged GRUMMAN ALBATROSS.

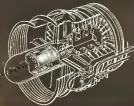
Originally developed for the Navy, the ALBATROSS is now operated by that service, as well as the Air Force and the Coast Guard.



GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE,

Contractors to the Armed Forces

## SUNDSTRAND'S Constant Speed Drive saves space and weight on the "Scorpion"



**compact, easily installed, mounts  
directly onto 10" pad of engine**

Fixed with sharply increased demand for constant frequency AC power on the "Scorpion F-89" Northrop design team turned to Sundstrand Constant Speed Drives for the answer. In a relatively short time, an adaptation of the Sundstrand unit was developed which mounted directly onto the turbo jet engines—requiring a minimum of design revision. Result—the hundreds of electrical components in the elaborate radar search gear of this all-weather intercept fighter are powered with constant frequency AC current as a decided saving of space and weight. If you have an aircraft electrical problem, come to Sundstrand for reliable research, expert engineering, and precision production.

### FACTS ABOUT THE USAF NORTHROP SCORPION

- Gross weight, over 33,000 lbs.
- Speed, 605 MPH class
- Altitude, over 43,000 ft.
- Previously powered by twin Allison J-35 turbo-jets
- Equipped with electronically aimed armament



**SUNDSTRAND  
AIRCRAFT  
HYDRAULICS**  
SUNDSTRAND MACHINE TOOL CO.  
HYDRAULIC DIVISION, ROCKFORD, ILL.

AIRCRAFT AND INDUSTRIAL HYDRAULIC TRANSMISSIONS, TURBO MOTORS AND VALVES • OIL BUBBLE PUMPS • RESEARCH  
CATHES • MISCELLANEOUS AND SPECIAL MACHINES • ROBBING TOOLS • MAGNETIC CHUCKS

## B.F. Goodrich



## 8 miles high without bubble trouble

THE CANOPY REBUBBLING for military aircraft, like the Northrop Scorpion shown, had to be safely performed at altitudes of 8 miles or higher. But the ordinary inflatable seals between bubble and cockpit couldn't take the effects of high pressures on the inside, low pressures on the outside.

B. F. Goodrich engineers, called in by the customer, studied the problem. A really effective seal, they believed, should stretch very little or not at all. Less stretch would mean lower pressure, less stress. They worked out a seal with a solid base formed to the rim of the cockpit and a collected fabric covering that simply lifts when inflated

so from the sealing rub. When this rub inflates, it works like blowing up a paper bag—low pressure stretches it up as full expansion and doesn't stretch the fabric enough to marce it. Dangerous stretching of rub seal (like blowing up a toy balloon) is eliminated.

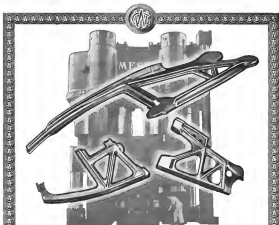
The new seal works almost instantly. It lives to 100,000 cycles with less pressure than old type seals needed at room temperature. There are other advantages. It means wear and damage heavy duty ordinary seals. It fits complex curves better. It seals and stands faster. Sliding wear and sealing are maintained. It has proved so superior that it has been adopted by McDonnell

Douglas, Chance Vought, Convair, North American, Fairchild and other airplanes besides the Northrop Scorpion.

This new type seal is one of many developments for aviation that has come from B. F. Goodrich rubber research and engineering. Other aviation products include: radar windows and lenses, bonded rubber, De Krom, Armac, Plastolac adhesives, Passmore Sealing, Zippers, fuel cells, Rivnuts, accessories. The B. F. Goodrich Company, Akron, Ohio.

**B.F. Goodrich**  
FIRST IN RUBBER





**Greater Size and Speed in Aircraft**  
have matched engineering progress, the solution of which has required larger and larger forgings of high-strength aluminum alloy. Examples shown above are forged structural members used in a modern military bomber, the largest more than seven feet over all. These are forged on a 13,000-ton press, the biggest ever built in this country.

**Wyman-Gordon Experience**—the most extensive in this industry in keeping abreast of new forging demands involving the use of Steel, Aluminum, Inconel, High Density Alloys and Titanium.

**Standard of the Industry for**  
**More than Sixty-five Years**

**WYMAN-GORDON**  
FORGINGS OF ALUMINUM • MAGNESIUM • STEEL  
WORCESTER, MASSACHUSETTS  
HARVEY, ILLINOIS      DETROIT, MICHIGAN

## Boeing Plans Jet Transport in 1954

Boeing Aircraft Co. last week laid its two principal U. S. competitors to the punch by promising, in effect, to flight test a commercial prototype jet transport within two years. No U. S. competitor has publicly announced a firm jet transport construction program. And it is believed unlikely that either Douglas or Lockheed, the other manufacturers known to be planning jet transports, will produce a prototype within the next two years.

While Boeing did not publicize its flight tests within two years, that is the interpretation engineers placed on Boeing President William M. Allen's carefully worded announcement—a comment that his company "has for some time been engaged in a concerted research project which will enable it to demonstrate a prototype jet airplane of new design in the nearer services of the commercial airlines in the autumn of 1954."

► **First Details**—The new jet transport, a Boeing spokesman told *Airweek* Will, will draw heavily on experience gained in development and production of the B-47 and B-52 jet bombers. The prototype Boeing "is an excellent position comparison was," he said.

First details and statements reveal that the Boeing transport was built, and fly, like appeared in *Airweek* Will. June 18, 1953, p. 19. Boeing's Model 473 design proposal had defined B-47 and B-52 characteristics, including wing and tail shape and the two-point wing and tail.

(Daguer) has a full-scale layout, map of its DC-8 proposal, first details of which appeared in *Airweek* Will Aug. 11, p. 113.)

Since the Boeing Model 473 was designed, it is indicated some changes have been made. This might point to the B-52's Pratt & Whitney J-57 power plant as the logical one for the jet transport. A company spokesman says the design will incorporate "some new developments and advancements" of the B-52. Other B-52 features in the transport may include such wing structures, advancements as the "twin engines," engines and other large items.

► **Scat Layout**—The Model 473 proposal to the airline suggested three passenger seating arrangements: a five-seat, 97-passenger coach and two 63-passenger sections, one domestic and one international. Boeing quoted a cruising speed of 500 mph at 40,000 ft and a maximum speed of 510 mph



MODEL 473 F99 DISINTEGRATES only 120 ft. off the ground while shelling the crowd viewing the International Aviation Exposition at Detroit during the Labor Day weekend.

with a normal rated power and 121,000 lb gross weight at 40,000 ft.

Presumably, the engine would be slung in pairs under the wings like the B-47 engine installation. Model 473 design called for two double pods, but there has been some consideration of four separate pod installations.

## Domestic

Boeing B-47 transport version not being delivered by General Electric Co., apparently 14 months after the firm received a production contract from USAF.

Scheduled jet delivery contract in the U. S. is "some \$1.5 million" according to H. M. Hines, president of the Boeing Corp. He added that to compete with the DC-8, "we must have profitability at least twice the cost" of the Canair's.

Wing stress damaged Canair A18, 11. Worth, Tenn., totally destroying an B-36 and collecting major damage to at least six others. Power was damaged at the Canair Plant. Worth plant adjacent to the USAF base and considerable damage was done to B-36 servicing stands.

Chase Aircraft Co., Inc., has signed a 99-year lease with Mexico Coast, N. J., for 64 acres at Meyer's Coast Airport "W. Texas." Three plans to erect a \$1-million plant on the site with initial work to start soon. Chase's present facility would be moved back to New York by the next year.

Lockheed F-80 had flown 37% of all turbine turbines in Korea as of July 31

weekend. Five quarters was lost in the gyroscopic crash which killed pilot and salesman. Other F-80s (background) ranged smoothly.

According to USAF—More than 60,000 sorties are credited to the P-51 Shooting Star. Altogether 128 Lockheed were knocked down in that time; only 12% being destroyed in the air.

Twin-engine Navion conversions will be handled by Jack Rely Aircraft Manufacturing Co., Inc., Ft. Lauderdale, Fla., and Longwood, Fla. Davis Equipment Co., Los Angeles, retains engineering control of the project, which was disclosed in *Airweek* Will Mar. 31, p. 28.

## Financial

Texas World Airlines reports \$3,537,403 net income after taxes, as the first half of 1953. Second quarter earnings were \$2,510,325.

Seaboard & Western Airlines is paying a 10-cent-per-share dividend on common stock payable Sept. 18 in holders of record on Sept. 9.

Shink Airways reports an \$18,900 profit after taxes for July compared with a \$14,848 loss in July last year.

Northwest Airlines reports net profit after taxes of \$277,250 during July on operating revenues totaling \$5,185,853.

Honey F Kaiser Co. has completed a \$22-million lease agreement with a group of banks.

Ryan Aeronautical Co., San Diego, Calif., notes net profit for the year ending ended July 31 was \$609,605, with gross income for the period being \$2,139,520.



# ACTION PACKED!

Chase Assault Transports are now performing, as active, functions which previously were deemed impossibilities—the delivery—ready for action, of heavy arms and equipment directly to front line areas, by landing in well sequestered fields.

Recent demonstrations of this new technique have proven beyond doubt that its potentialities for revolutionizing present military concepts are unlimited.

Chase Assault Transports ruggedly built to absorb the withering punishment of front line missions, stand alone



## AVIATION CALENDAR

- Sept. 8-10—American Standards Assn. third national communication conference, Madison Square Garden, New York
- Sept. 8-12—Instrument Society of America seventh national instrument conference and exhibit, Cleveland
- Sept. 8-13—American Rocket Society fall meeting, Hotel Sheraton, Chicago
- Sept. 14-15—Automotive Press, Publishers' Symp., Milan, Italy
- Sept. 15-19—International Air Transport Assn., eighth annual general meeting, Geneva, Switzerland
- Sept. 23-25—Air Transport Assn. annual engineering and maintenance conference, Society Hotel, Miami Beach, Fla. (closed morning this week)
- Sept. 24-25—Radio Technical Commission for Automaticity assembly meeting, Hotel Statler, Buffalo, N. Y.
- Sept. 25-26—Aviation Medical Assn., annual meeting, Paris, France
- Sept. 27—Nutsucker Air Tim dinner and luncheon dinner (Aviation Order of the United Statesmen), Ft. Worth
- Sept. 29-Oct. 3—National Electronics Conference, Sheraton Hotel, Chicago
- Sept. 30-Oct. 2—Aviation Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Toledo
- Oct. 1-6—Society of Automotive Engineers, national assembly meeting, aerial acrobatics display and aircraft production luncheon, Hotel Statler, Los Angeles
- Oct. 7—Aerospace Electrical Society sixth annual display meeting, Fox Radio Auditorium, Los Angeles
- Oct. 9-10—Super management operations conference, Glendale University
- Oct. 11-15—Fourth annual All-Time Air Test, information available from Texas Instruments Company, Austin
- Oct. 16-18—American Wildlife Society, 10th annual fall meeting, Delaware-Scholarship Hotel, Philadelphia
- Oct. 21-Nov. 1—International aviation and travel exposition, New York, Chicago
- Oct. 26-28—European Aircraft Hydraulic Systems Conference, sponsored by Wehco, Inc., Hotel Park Sheraton, Detroit
- Oct. 28-30—AEE Air Transport Council, annual meeting, Commodore Perry Hotel, Toledo
- Nov. 6-7—National book and magazine meeting, Society of Automotive Engineers, The Mayo, Tulsa, Okla.
- Nov. 11-12—Fiber distributors' annual meeting, Los Angeles, Pa.
- Nov. 17-18—National Aviation Trade Assn. annual convention, Hollywood-Rosewood Hotel, Los Angeles
- Dec. 3—Symposium on biological noise, symposium and exhibition for hearing, NAE, ASME, IAS and AIAA

### PICTURE CREDITS

1—White World; 2—Ludlow; Aircraft Corp. 4-15—McNally; Aircraft Inc.

## Washington Roundup

### Through Rose-Colored Glasses

Secretary for Air Thomas Finletter and Secretary of Navy Dan Kanfield were wearing rose-colored glasses when they pushed three pieces of U. S. air power for American Legationnaires.

This was on the same day Senate Procedures Committee, headed by Sen. Lyndon Johnson, released its black picture. Inevitably, the Johnson report on the status of air power was based on testimony from USARP and Navy—before the most recent "stockpile" of the air program.

### Johnson subcommittee:

"As of March 11, although our percentage of jet air craft had increased we had fewer planes in the Air Force than at the start of the Korean war. Of those planes, a greater proportion of them was second line than before Korea."

"In other words . . . there has been a net loss in total resources from July 1, 1950, to March 11, 1952."

"The total inventory requirement for 126 modern combat aircraft, as of April, was three times the number of modern aircraft available."

"By July we had only one-half of the combat wings with modern equipment which was demanded."

"Our Naval Air force picture is no better. As of March 11, the Navy had less planes than it had at the start of the Korean war. Moreover, the preponderance of second-line planes in total inventory was greater . . . The status of jet to piston engines was equally low . . . This dismal picture was painted even blacker by the Deputy Chief of Naval Operations for Air when he pointed out that production shipments were continuing, and that schedules had not been met in the past, and were still not being met."

### Secretary Finletter:

"The Air Force is in pretty good shape to take care of any contingency which might happen now or in the near future. . . . If anything happens today we would be in a position, unlike through our Strategic Air Command, to deliver a blow of the silicon revolution upon anyone who might start anything. Our striking power in the Strategic Air Command, I believe, the most dreadful weapon that had ever been in the hands of man . . . The basic objective of the whole air establishment is to provide a chance to work out a peaceful world . . . but in the meantime, we do not intend to let our guard down."

### Secretary Kinball:

"At present, our Naval (marine power) forces is more places throughout the world are providing a powerful deterrent to the spread of aggression . . . In the aviation field, we have several planes now coming into production which can outperform the best planes known to be in the hands of their opponents on any of the world. We have even better aircraft in the developmental stage. All of the aircraft we are now getting are entirely new since the war."

### Finletter's Advice

Secretary Finletter's advice to American Legationnaires, personally directed at colonies of the Air Force by the Johnson subcommittee for specific instances of waste of manpower and funds:

"Do not become too impatient at some of the individual signs of mismanagement . . . we are really more of these things and are trying to do our best . . . Do not give anybody complaint in some of the examples of mismanagement which are brought in your statements. I believe you have to look at the overall picture."

The Johnson subcommittee did so in its last report. It found:

"The history of our air buildup is a story of bad planning, neglected savings, lack of coordination, abuse, waste, and abuse of power, bad advice to the executive, and a general refusal on the part of our government agencies to pull together or work together in a dedicated way to strengthen our air arm."

### Feaster: Rosy Picture, Too

Deputy Secretary of Defense William Feaster had very words for American Legationnaires on defense production—which were also at odds with Johnson Subcommittee observations:

"It is proper defense for the U. S. being provided Feaster 'An unqualified yes'."

But these words, according to the Johnson Subcommittee, "little effective suggestion, less cooperation and a pitifully insignificant amount of coordination." Feaster "The status of the armed forces is carrying out the unprecedented triple management—military, industrial, and economic, Korean war, development of military, new weapons—has been due largely to the coordination in agriculture, research, procurement, and management brought about through unification . . . the firing of our military program together . . . has increased our ability to live with the peace."

At present "improvements in aircraft planning have been achieved by holding up production." Feaster "Instead of producing and storing millions of weapons . . . we are changing the tooling in our production lines to reflect the latest outstanding technical requirements, and the weapons and equipment produced are the finest and finest" designs already becoming obsolescent."

### Industry to Blame?

Air Force is pointing blame on the industry for U. S. failure to develop and utilize heavy planes:

USAF Undersecretary, Roswell Gilpatric reviewed for Senate Appropriations Committee: "Aircraft manufacturers simply said, 'We don't think we can do this type of job.'"

Sen. Homer Ferguson: "But if you had to do them, 'We want that machine installed in our plant,' do you mean to say this would not have allowed you to build it?"

Gilpatric: "They were not interested in the output of these planes up to a year ago. They said, 'We do not want to make our airplanes out of fatigue. We want to machine the parts.'"

Sen. Joseph C. McCarroll: "Industry said that?"

Gilpatric: "Yes, they were not concerned that was the way to build airplanes at designed loads."

Ferguson: "Have you converted them back?"

Gilpatric: "Yes. We had a survey made last fall and they completely changed their mind."

—Katherine Johnson



# A PHOTO FINISH!

for HOP-A-LONG  
and WHIRL-O-WAY

Forewick, Scotland, July 31—An Avian Helicopter, "Hop-A-Long" and "Whirl-O-Way" landed at Prestwick Airport, Scotland, today marking completion of the first flight of the Airborne by helicopter taking off from Woomers Air Force Base, Mass., the new Sikorsky H-19's main stage at Forewick, Greenland and Iceland. A new long-distance helicopter record was set by the 140-mile hop from Iceland to Forewick.



Avien is justifiably proud of the fact that these helicopters (and 45 other military aircraft) use Avien Capacitor-Type Fuel Gauge Installations.

Other Avian instruments and controls include:  
JET ENGINE THRUST INDICATOR  
CYLINDER HEAD TEMPERATURE INDICATOR  
FUEL BALANCING CONTROLS

EXHAUST GAS THERMOMETER  
CAPACITOR TYPE LEVEL SWITCHES  
MAXIMIZING CIRCUITS  
DC REFERENCE VOLTAGE STANDARD

AVIATION  
ENGINEERING  
CORPORATION

# AVIEN

34 56 50TH STREET  
WOODSIDE, L. I.  
NEW YORK

## WHO'S WHERE

### In the Front Office

King Williams has been designated special assistant to the president of Pacific Air Lines Corp. and will handle a special assignment in the firm's European representative. Williams was scheduled to leave for the Caribbean Sept. 1 to investigate the large market for P.A.L. He is a former director of the Elston Company of Cambridge. New manager of P.A.L.'s marketing division is Anthony J. Kozmin. E. E. Black has been named administrative assistant of the division.

Charles D. From, formerly executive vice president of the National Air Council, has become a senior associate and manager of Washington, D. C., office of the Lyndon B. Johnson, Inc. and public relations firm in N. Y. C.

Donny L. McGee and Stanley F. Davis have been discussed vice presidents and directors of Northwestern Aircraft Co., St. Paul, Minn., fixed base operator and overhaul base.

J. Donald Gagne has been named vice president engineering and assistant general manager of East Coast Aircrafts, Inc., Yonkers, Mass., N. Y., a subsidiary of Boeing Steel Corp. Gagne has been chief engineer with DCA since 1945.

W. C. Whitcomb has been elected senior vice president of the General Corp. He returns for position as manager of the Iowa Army Air Corps, which he has held since 1945. B. N. Jones, vice president sales of Johnson Mfg. Co., a General division, will report as the president's office on special assignments and W. J. Perkins, assistant to the president, has been named Aircraft director of sales and service.

### Changes

J. W. Allen has been promoted to chief engineering/technical assistant of Eclipse Aircraft Division of Bendix Aviation Corp., Teterboro, N. J. Other E.P. promotions include E. F. Kerkhove, chief engineering/technical assistant, E. E. Boush, chief engineer, mechanical accessories, M. E. Blumstein, chief staff engineer, H. Kozmin, chief engineer mechanical accessories, M. Lash, chief engineer production layout and P. A. Norton, chief in charge customer plots. E. J. Gorman has been appointed chief of chief engineers, customer equipment. G. M. Gorman is in charge, Perkins.

William H. Maugh has been named joint training agent for Cessna Aircraft division of United Aircraft Corp., Dallas, Tex., according to William F. Gentry, its agent.

Charles W. Grouse has been appointed manager of team, a new position, for North west Airlines and Jack Kriller has been named manager of service sales.

A. G. Williams, American aircraft repair plant manager with McDonnell Aircraft Corp., is the new chief engineer of the Fairchild Corp., Aircraft division, Teterboro, N. J.

Capt. Richard E. White, USNR, has been appointed Vice Commodore of the Naval Air Station in Washington, D. C.

## INDUSTRY OBSERVER

First application of the transition packaged engine leading system is still in effect will be for the Douglas C-124 cargo plane. Prototype conversion are now under construction. Meanwhile, plans to take some conversion to H. the Gemini XC-99 have been decided since it is not expected that additional plans of this type will be built.

Application of small gas turbine engines in power aircraft studies, showing over the big new turboprops now coming into use, makes an interesting solution for U. S. engine studies. Ultimate development may result in turbines small enough and light enough to carry in the airplanes. Two of the small Boeing turbines are being used in a starter cart for the YF-12 and X-15, but later 3-5 lb. are expected to have high-G conventional turbine starters incorporated in the plane.

Site attraction of the strike Detroit air show was the Douglas D-558-3 Skyrocket, holding unofficial world's speed and altitude records. The rugged nose sweeping while aircraft craft was inspected by many thousands in its first public appearance.

While only one of the Navy jet fighters, a Grumman F9F, was designed in flight refueling with the North American AJ-1 refueling tanker, other new Navy jets making their bow at the Detroit show, such as the Grumman F7U-3 Cougar, the North American F12 and the Inter-cepting Grumman F7E Cougar, this will be the first for the refueling operation. These new fighters were described officially by the Navy for the first time last week in the 45,000-ft. altitude and 670 mph. speed class.

Increased military sources speculate that the General Electric version of the British Olympus two-compressor turbojet will be competitive in power with the Pratt & Whitney J57, currently the most powerful U. S. jet engine. Bearing out this speculation is the fact the British recently have mentioned the Olympus has a thrust rating of 5,250 lb. Presumably this measurement would not be made until the manufacturer was satisfied that engine power was well beyond that figure. Both the "two-spool" engine should lead out maximum in the 15,000-20,000 lb. power class, which means to be the next stage of production engine beyond the current 10,000-lb. thrust class.

Army now has three helicopter transportation companies in being and progress seems sure, each to be equipped with 21 large cargo versions plus two utility variants.

Navy expects the Douglas F4D Skyray interceptor and the McDonnell F3H Phantom general purpose fighter to complete carrier suitability tests within the next few months. Also, first flight of Navy's new jet Douglas A1H attack-bomber is due this fall.

Following modernization of Eschschig engines to carry bigger and heavier loads, the Navy is now considering a similar program for its larger 45,000-ton Midway class carriers built at the close of World War II. Favorable such modernization may include replacement of present Eschschig with the British developed steam turbine engines required for the turbocharged Fairchild class carriers. Navy has and the British design a powerful enough to launch its latest jet fighters even when a carrier is at anchor in storming down wind.

As France says the present strength of the USAF is 96 wings, that it is expected to climb to about 128 wings by 1959, up to 145 in 1955.

Grumman's XF10F-1, Japan, carrier-based Navy, fighter is said to have exceeded Mach 1.0 during a series of flight tests at Edwards AFB, Calif., in tests of reported F4E engine and longitudinal engine stability problems are believed to be the cause of the problems. (Grumman's) successful efforts to develop an advanced-type control surface based for high speed jets to replace the currently used hydraulic boost system. Consistency of engine and stability problems explains why the XF10F has made only a dozen flights since it was flown to Edwards last spring in a Douglas C-124A C-124A.

## RAF Transonic Deltas Star at SBAC Show

- New military designs in Farnborough spotlight.
- But share interest with fast commercial types.

By Robert B. Holt  
(By Cable to Aviation Week)

Farnborough, England—British dependence on the transonic delta wing to transform the Royal Air Force into a modern air armada capable of fighting at transonic speeds was evident at the opening of the 1952 Society of British Aircraft Constructors exhibition at Farnborough before a record crowd of foreign military and civil air officials.

Although the British drive for exports to hard currency markets is yielding a new financial push over prospects of commercial jet transport sales to U. S. airlines, more emphasis was on the new production of transonic military aircraft, still in the prototype development stage and at least an early year away from significant production and military service in air force of NATO nations.

• **Twin Star—** American products were represented by a flight of four North American F-86s held under license by Canadian and flown by RCAF pilots who are used at the air defense of England. The F-86 still is the best jet fighter in operation service in England.

Two stars in the transonic glass were a pair of Gloster Javelins, group delta prototypes already ordered into representative production. One is the Avon Model C95 trainer bomber that made its first flight only two days before the SBAC show opened. The other is the Gloster Javelin, a two-seat jet fighter fighter making its initial public appearance at the show.

On the first two test flights the Avon C95 developed landing gear trouble and failed to appear on opening day, although it flew from Avon's Manchester plant to the Ministry of Supply experimental field at Boscombe Down. It was scheduled to fly over the SBAC show, an short hops from Boscombe Down later in the week.

• **One-Man Gun—** Test pilot Richard Falk, solo over exhibition for the giant bomber, handled a delta wing plane cruising at the 150,000 ft. class with a span of about 190 ft. and length of approximately 110 ft. The four



GLOSTER JAVELIN becomes a RAF's latest super priority jet fighter interceptor.



JAVELIN puts engine, armament, horsepower fuel tests in its head delta wing.



VICKERS SUPERMARINE 505 is for Royal Navy, accompanying VS Swift in RAF fighter

Armstrong Siddeley Sapphire engines, each delivering 6,500 lb. thrust, and based in wing roots with air inlets along the leading edge of the wing.

The Avon C95 has an horizontal tail and comes equipped for dogfighting close range. The great bomber was developed from earlier Avon work with two delta second planes, the 703A and B (Aviation Week Oct. 5, 1952, p. 12), which was considered flying scale models of the 505.

Avon also is building a pair of delta wing training planes with side-by-side seating to attract military pilots in building characteristics of this type, new to military service.

• **Javelin vs. DH 110—**The Gloster Javelin was its super priority production using as a still flight test evaluation against the de Havilland Model 150 which John Deere pushed past SBAC results at well over 700 mph on deck.

The Gloster Javelin (formerly G.A. 5) is powered by two Armstrong Siddeley Sapphire engines in the wings alongside the tail. It spans 53 ft. and is 37 ft. long. Gloster officials say that the plane's fuel capacity is "unlimited."

Its broad delta wing provides considerable space for storage of heavy armament, such fuel and equipment necessary for long fighting operations. Its exceptionally good maneuverability is claimed for the Javelin.

The first Javelin test its designers during an early test flight and was destroyed on landing. Gloster test pilot Bill Winstanley obviously was under orders to keep the Javelin out of high speed range at the show and did most of his flying in slow turn circles with type down. In contrast the DH 110 gave an excellent demonstration of its high speed characteristics and extreme versatility although SBAC officials gave Derry from making a supersonic dive with resultant shock wave shattering because of noise complaints.

The DH 110 is essentially the wing plan of the earlier DH-103 jetless research plane with addition of a modern, turbine driven jet of the traditional de Havilland twin turbojets.

• **Vickers 585—**Another extremely interesting military type was the Vickers Supermarine Type 585 twin jet armed fighter powered by two Avons. The prototype flown at the show by Mike Lufgus featured an extremely thin straight wing and V-shaped tail. However, production versions will shift to an existing with conventional tail. Under Lufgus's expert handling it was obvious that twin Avons offered tremendous power for the airframe configuration.

In addition to its excellent high speed performance, Type 585 demonstrated insatiable stability at extremely low

## Also Shown at Farnborough Display . . .



GLYNIS CANBERRA will test powerful Bristol engines for future application.



AVRO SHACKLETON 2 subsonic jet bomber shows some indication of subsonic



SAUNDERS-ROE SKEETER is being offered for military and light civil markets



SAUNDERS-ROE PRINCESS is 140-ton wing host powered by two Bristol turbojets

speeds required for aircraft carrier approach and landings.

A new version of the sweeping Vickers Vulture jet bomber also made its initial public appearance. It sported a thinner wing than the original prototype which cracked in a test flight last

year. Air pilots for the four Avon jets also were engaged and engaged at three wing root locations.

• **Missing From Show—**Originally scheduled but now missing from the display were Avroton Pad P. 120, another delta wing research plane that crashed







a major obstacle to production. Attention should be directed "to the cost built in over-all weight and in dollars that must be charged to every new aircraft and every new device for more and more performance."

Are all the demands that we are putting on our aircraft absolutely necessary to ensure combat effectiveness... or are we imposing ourselves completely out of the picture?

**Equal Forces**—Although the current FY55 fiscal year budget represents "the first wedge" into the "equal force" concept, it has not been completely decided. When the decision was made to cut the defense budget from \$75 to \$72 billion, "almost equal amounts were pared from the three major budgets."

Air power should be the first priority in the defense buildup.

"We have committed ourselves to a strategic posture—the atom bomb."

Although it too will not be tied solely to air power, it can best be executed and used in the early stages of any conflict is that way.

"If the transport of the atomic bomb is the essential fulcrum of our

offensive power, its delivery is the vital element of our early military strategy. The complementation of land and sea forces is secondary and must be so budgeted, in terms of time particularly. If the enemy proposes the same method of aggression, our defensive effort must rely, of necessity, on our internal air security. That this suggests a preponderant effort directed entirely to increased air power is obvious.

"A balance of forces is not an equality of forces. . . . We will need to perfect a real balance based upon the facts of modern war."

## AA DC-7s to Get Sperry Autopilots

American Airlines will equip its 35 new DC-7s now on order with Sperry A-12 autopilots, complete with ILS approach, complex and a newly developed recall device designed to automatically disengage the autopilot in event of malfunctions.

In confirming the equipment purchase, a Sperry spokesman said the new cut-off, the mark of several years de-

velopment, was an accelerometer which detects any abrupt acceleration about the pitch axis.

This accelerometer signal is used to trigger the autopilot cut-off device and thus a warning light under either of two conditions.

• If the plane climbs or dives and the autopilot fails to develop the correct control signal to level the plane.

• If the autopilot develops a control signal without a previous pitch indicator which needs such autopilot correction.

The automatic pilots and approach computers will be installed by Douglas prior to delivery of the DC-7s, scheduled to begin early in 1955. The automatic control system will be installed by American Airlines after the DC-7s are in service.

American indicated it has been particularly interested in the concept of the automatic cutoff. With the Sperry design becoming available for DC-7s, American expressed confidence that the complete Sperry system will help the airline make definite strides toward improved schedule reliability during conditions of low ceilings and visibility.

## Engineered to an entirely new concept of efficiency

Qualified to function under extreme HIGH-g conditions

By engineering to new basic principles, the Hydro-Aire Gate Valve offers many innovations and advantages. It is qualified to function under extreme "high-g" conditions. It is lighter, smaller, and less expensive. Refiller has been completely eliminated. The introduction of an entirely new type clutch and manual override offers far more efficient and far safer operation.

Here is an engineering accomplishment, thoroughly tested, completely proved and in production, ready to deliver to you a new concept of Gate Valve efficiency and simplicity.

Sizes 1½", 2", 2½", 3" Manual override: Position indicator. Operates with oil, vacuum, fuel, engine oil, hydraulic oil, diesel, water, air, and gas. Manually operated version available.

**HYDRO-AIRE** Inc.  
BURBANK, CALIFORNIA  
Subsidiary of Crane Co.



Hydro-Aire's  
New Gate Valve  
No. 3007



### NAVY TESTS AIR REFUELING

Following Air Force's lead, Navy is moving from oil refueling to fueling with jet fuel. They are using jet fuel to power carrier boats jet burners on long distance, one-way. Above, a Grumman F11F Panther takes on jet fuel from modified North American RAJ-1 using the bubble-developed push-and-draw system. The AJ has had its fuselage mounted jet engine removed to permit storage of hose and perforations. The tests were under supervision of the Naval Air Test Center, Patuxent, Md. As left is an aerial's inspection of the Grumman F11F's engine taking on fuel through hose extending from wingtip of Coastal P15 to booster flying boat. At least two planes could be refueled simultaneously. Navy has ordered a number of AJ-1s modified as small tankers (Aviation Week Sept. 1, p. 11).

# ECLIPSE-PIONEER

Dedicated to the design and manufacture of products for the Precision Industries

## AUTOMATIC PILOT AND FLIGHT PATH CONTROL EQUIPMENT

## AIRCRAFT AND ENGINE INSTRUMENTS

Automatic Fueling Systems For  
Fuel Flow  
Fuel Pressure  
Hydraulic Pressure  
Liquid Level  
Manifold Pressure  
Oil Pressure  
Rudder  
Throttle Pressure  
Water Pressure

Fuel Flow Tolerating Systems

Electric Fuelmeter Systems

Warning Units

In-Flight Refueling Systems

## FLIGHT AND NAVIGATION INSTRUMENTS

Accelerometers  
Altitude Indicators  
Vertical Rate Indicators  
Blackout Gyros  
Dual Radio and Magnetic Compass Indicators  
Cyclic Plus Dial® Compass  
Magnetic Compass  
Rate of Climb Indicators

Tare and Bulk Indicators  
Chart Range Computers

## POWER SUPPLY EQUIPMENT

A. C. Generators  
D. C. Generators  
Control Panels  
Fault Protection Systems / Switches  
Elec. Relays  
Overcharge Protectors  
Voltage Booster Dynamotors  
Voltage Regulators  
Power Failure Indicators  
A. C. Transfer Relays  
A. C. Load Controller

## AIR REFRIGERATION AND ICE EXAMINATION EQUIPMENT

Elements and Bimetallic  
Dialer System Therms  
Oil Thermometers  
Power  
Valves  
Refrigeration and Cool-Off Units  
Windshield Defoging Controls

## ENGINE STARTING EQUIPMENT

Master Cables  
Relay Switches  
Starter

## OXYGEN EQUIPMENT

Oxygen Regulators  
Liquid Oxygen Containers

## MISCELLANEOUS

Automatic Engine Power Controls  
Actuators  
Differential Pressure Switches  
Dash Boxes  
Flexible Drive Shafts  
Air Turbine Safety Assemblies

## PRECISION COMPONENTS FOR SERVO-MOTORS AND COMPUTING EQUIPMENT

Actuator Synthesizers  
(Transmitters, Amplifiers, Differential, Control Transformers and Feedback Amplifiers)  
Servo Motor and Systems  
Gates  
Data Generators  
Servo Motor Equipment  
Remote Indicating Systems

## FOUNDRY PRODUCTS

Sand, Investment Mold, and Die Castings of Aluminum and Aluminum for a wide variety of Aircraft and Industrial Applications. Hand-Fabricated Precision Resistor Mold Castings.

\*Eclipse-Pioneer is a Division of Bendix Corporation

**ECLIPSE-PIONEER** DIVISION OF

RESEARCH, INC.

2000 Broadway, New York 10007

2000 Broadway, New York 10007

**Bendix**  
CORPORATION

# AERONAUTICAL ENGINEERING

## High Aspect Ratio Cuts H.D. 31 Drag

- This means less power is needed to do jobs.
- Other advantages: Less weight and less fuel.

By David A. Anderson

Extremely high aspect ratio is one of the keys to reducing the cost of air transport, says H. Harel.

To back up that statement, his firm—Avions Harel-Dubois of Paris—is completing the first of two high wing H.D. 31 transports which feature an aspect ratio of 20.1, twice more than all contemporary American transports.

Prototype for the work was built on a series of experimental flights with the H.D. 30.01, a 75-hp high wing monoplane with an aspect ratio of 12.5. Government interest, followed Harel's demonstration of this aircraft, and orders were placed for two of the bigger planes using basically the same idea.

► Background—Harel's idea for obtaining the high-aspect-ratio wing paralleled those of the Institut Français de Technique Aeronautique.

This group, after a very comprehensive study of air freight about two years ago, concluded that there were then available only two new approaches to reduced cost of air freight.

One method was the wingbox engine, the other was a wing of extreme aspect ratio.

Harel had been thinking along the same lines, but was more interested in the high-aspect-ratio wing. The design laboratory and testing of the little airplane carried out his ideas and proved them.

The IFATA research paper stated by considering all the possible ways to reduce aircraft construction, operation and maintenance costs. It turned over the probabilities of lowering these costs, but new metallic advanced fuels, new approaches to construction. It also reconsidered the older ideas for reducing drag as weight—reductions in cooling, fuselage streamlining and fuselage joint techniques.

► Why High AR? Why choose a high aspect ratio wing because it decreases the induced drag component. That's why sailplanes—looking to cut out the last possible increment of drag—have such wings. And that's why transport



MODEL H.D. 31 shows its broad wing and high aspect ratio in two different views. First of two airplanes ordered by French Air Ministry is coming completion at the Paris factory of Harel-Dubois. Prototype flight date is set for end of this year.

aircraft generally use a higher aspect ratio than fighters.

Induced drag is an inverse function of aspect ratio. Double the ratio and you have the drag coefficient. You don't change the other drag components and lift, profile and skin friction and parasite drag of the surface stay with you.

So the aspect-ratio drag is to reduce induced drag in those places where it is going to give you the biggest penalty.

In other words, in flight conditions where the induced drag is a considerable side portion of the total drag.

Since induced drag is also a function of the square of the lift coefficient, it follows that the higher the lift coefficient, the higher the induced drag. Lifts are at low lift coefficients, and induced drag is one of the least of their worries.

Big transports—or load-carrying freighters—fly at moderate lift coefficients and the induced drag is a respectable portion of the total drag. Here is where we have to look for the big action on the transport.

► Harel's Studies—Harel went looking, too, and made a whole series of design studies to see if the theory would work out as positive.

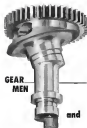
He requested the weight estimates for a variety of planes with equal power, wing section and area and equal range. Aspect ratios were varied from five to 40.

The studies produced some interesting angles. For example, under a present day transport with AR about equal to ten, if you were to up the aspect ratio to 20 or 30 you could increase the payload from two to 3.5 times. You'd also get a weight savings of about two or three times, and it is

### Harel-Dubois 31

Calculated Performance Data  
(1944 lbs. Weight C7 engine,  
300 hp vs. at takeoff)

- Max. speed low level 168 mph
- Max. speed 1930 ft 174 mph
- Cruising speed, 1930 ft 151 mph
- Landing speed 84 mph
- Takeoff distance 1310 ft
- Distance to clear 15 ft at 140 ft/sec with one engine failure at critical point 1,230 ft
- Time to climb to 10,000 ft 17.5 min
- Weight, rolling (on runway) 21,000 lb
- Weight, rolling weight on ground 19,000 lb



## MACHINES

It is not... because... and the spin is positive that defines the gear when they mesh. It is the drive from top management down to deliver the gear, trouble-free and on time, that constitutes the big difference between manufacturers of gears.

Amgear has complex facilities to produce a full range of diameters from five-pinch instrument and aircraft gears to heavy gears for construction equipment, and includes facilities for heat-treating gear assemblies to your specifications. Our large capacity in stock provides a completely initial, fully insured just-in-time service for each customer.

Amgear manufactures spur, bevel, helical, worm and worm gears, racks, straight and spiral gear and hard gear—of both pressure and commercial quality in any quantity.

Endless and open gear assemblies are an Amgear specialty. Many industrial concerns have found Amgear's experience in making complex gear assemblies both helpful and profitable.

It will save you in downtime. Why don't you call, write, or write for an Amgear Engineer?

**AMGEARS, INC.**

613 W. 60th St., Chicago 20, Ill.  
Phone 467-7100  
7850 Melrose, Detroit 27, Mich.



REMARKABLE. MYNG of Hazel Dunes Model 16 recently won first prize in a 12.5 Small craft was built to prove out Hazel's theories about such wings, but considerable flying time in its greater size. Careful planning of wing area, airfoil, low induced interference drag to zero, in some cases even producing negative drag moments.

increased takeoff run and reduced cruising speed.

"That apparently says that there is no point in experimenting with the high aspect ratio."

But suppose, thought Hord, that we compare on the basis of performance. Compare two planes having equal payload, range and single-engine climb. What then?

Hord found that an aircraft of his type would have a lower total weight of surfaces, powerplant and fuel than existing conventional types. The comparison to a DC-3 weighing 23,600 lb and carrying 7,275 lb of load over a distance of 800 mi. in a Hazel Dunes type of 21,225 lb. And the HD job would perform the same service at a cruising speed only 5% less than that of the DC-3. Takeoff distances would be the same.

What's the Catch?—Hord found—shown before him—during the flight of a prototype wing, which was rapidly in the aspect ratio increases. Above an AR of 12, the weight was prohibitive.

Hord made his studies for both the envelope and the externally heated wing, and found that the heated structure could continue to be made light at very high aspect ratios.

A typical heated wing of AR equal to 30 weighed only twice as much as a

wing with AR of ten. Increasing the AR of a cylinder wing only to 15 was enough to double its weight.

The costs appeared to be in the drag increase of the heated wing. Interfering flow between wing and strut, due to surfaces forced in the connection between the two surfaces, caused drag increments greater than the reductions obtained from the increased aspect ratio.

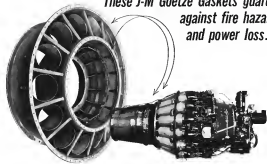
So Hord worked out a method of reducing the surface area to zero, in fact, under certain conditions a drag reduction is produced at the intersection of wing and strut. Most of the strut area produces lift which adds up with the wing lift.

Heat conductance decreases from the fuselage to the point of wing intersection. Wing incidence is constant because the fuselage and the strut are constant, and their distances to the wingtip. This reduced keeps the air from fracturing at low speeds.

Aerodynamic Friction—Full surfaces for aircraft with high aspect ratios can be designed smaller and therefore lighter. The tail of the HD-10 still has to handle both the true changes and ordering power shifts during changes of angle of attack.

But for a high aspect ratio wing, which has a very small chord, the physical dimensions of these CP changes in

**These J-M Goetze Gaskets guard against fire hazard and power loss...**



Arrows point to J-M Goetze multi-vane gaskets on the inner and outer vanes, and their approximate location on the 333 carbide engine surface finish.

**...on powerful turbojet engines like the J33**

Sealing the inner and outer vanes on the J33 to prevent leakage of fuel and flame between vanes is a major example of the many tough, critical sealing jobs entrusted to Goetze custom-crafted metallic gaskets.

For this particular service condition, the Goetze gasket specified is made from a flat gasket design... with the metal on both edges rolled around an exhaust filler. This construction provides the resilience needed to overcome the warpage encountered in these applications. Like all Goetze gaskets, this style is precision-made to fit tight and stay tight in service.

There is a Johns-Manville Goetze gasket for practically every jet en-

gine requirement. Goetze craftsmen fabricate them in almost any shape or size for sealing gas-turbine, compressor bleed-off, cross-ignition tubes, combustion chambers, fuel nozzles, turbine drive lines, etc. Backed by more than 60 years of Goetze "know-how," these durable gaskets are solving many of industry's most complex sealing problems.

Why not write for further information: these Johns-Manville Goetze gaskets... available in flight-proven products for the aviation industry. Ask for your copy of Brochure AV-1A. Address: Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.



Close-up of J-M Goetze multi-vane gaskets used to seal inner and outer engine gaskets on jet engine turbine cases.



**Johns-Manville**

**PRODUCTS for the AVIATION INDUSTRY**

# Visit MEXICO during American's Fiesta Fare Season



## 50% OFF

Your Return Fare!  
(Sept. 15th thru Dec. 15th)

- Choice of 3 to 10 day Package Tours
- Generous 15 day Return Trip Limit
- Flagship Luxury Going and Coming



AMERICAN'S LEADING AIRLINE

AMERICAN AIRLINES INC.

weight and can be easily handled by moderate test areas.

The downwash from a wing of small chord is the less pronounced than from a wing of large chord. So there is less reduction in angle of attack of the tail with the high AR wing of the Hawk-Dobson series.

These two factors—two and downwash—helped to prevent a reduction of tail area and weight and a reduction of manufacturing weight.

General stresses produced in airframe deflection on wings of large span are particularly severe. Here's wing structure is formed of two Alusonic shells with electrically welded stiffeners. The shells are assembled with locking and twisting edge bolts.

► **Engines.** Pushman-Engine has been given a number of problems. Because of the narrow chord, there may be some difficulty in obtaining high power engines with their high laminar streamlines. And these engines are not to be included in the work, as there will be no income to build one.

This suggests that Hawk-Dobson series may be better suited for turbojet engines—these're lighter, smoother running and give less drag.

Being a more advantageous on facilities of large depth because the

weight of the struts decreases in the included angle between strut and wing surface. High and narrow forewings are not advantageous commercially, because of their loading problems with small floor space. But this situation breaks down where the gross weight of the plane is large enough to warrant a double-deck fuselage.

► **Big Transport.**—Although stress of Hawk-Dobson wing incorporated into the experimental lightness, test values have to be proved by the flight tests of the H. D. 11, the two-engine transport.

When Armstrong-Wicks visited the Hawk-Dobson plant recently, construction of the ship was well along, with first flight expected somewhere at the end of this year.

► **Parasails.**—Parasails are estimated to be about 75% complete, wing center section about 90%.

The ship is not highly maneuvered, but is being generally used. Work is being done on a high order, and Galle people in the work, very much.

In October 1951 the factory was an empty hangar, inside of six months' construction and often had been in the building and construction of the factory had begun.

► **Basic Design.**—The H. D. 11 is a



GOOD TO THE LAST DROP

With water also greatly increased and some more exposed, the damaged vehicle at NAGAN, Ames Research Laboratory, Moffett Field, Calif., is being studied for fuel. The number two in this case has a standard recoverable body with a variety of wing shapes for determination

of aerodynamic characteristics. Dropped from high altitudes the vehicle runs through the water then drops the plugs to work. Automatic autonomous recovery data during the drop, dive brakes and a parachute recover the vehicle in unobstructed conditions.



### Shaped Wire\*

- Flat
- Round
- Cold Curved

Look in high carbon, stainless, special alloy, Anneal. You draw the shape—HARD and draw the wire.

### Armature-Bonding Wire

Timot stainless or carbon steel. To make of 50 to 100 pounds. Resistant has high tensile strength, high resistance, low permeability.

### Lock Safety Wire

Tough, durable, workable. To the size and type for your work.

### Spring Wire

Any shape\*... High carbon... Cold drawn... High tensile... Stainless... galvanized... Tinned... Bright.

\*Cold drawn stress up to 230% capacity, adding to 50% within 10 minutes, with recovery exceeding 6 in 1.

### YOU do this—

Give us the specifications of the wire you need—or tell us details of job to be done.

### WE'll do this—

Send your recommendations, prices and delivery date. Samples on request. Paid offers you a wide variety of sizes to choose from.

Write us  
Today

ACCO



PAGE WIRE

AMERICAN CRUISE & CABLE

Address: 1400 North Street, New York, N.Y. 10011. Phone: (212) 691-1111. Telex: 100000. Cable: ACCO.



## ...achieved by EDISON engineers

Vibration in the lower frequencies revised many performance specifications when structural engineers tackled the job of designing rotary-wing aircraft.

In the case of fire detection, Bell, Pusecki and Stoenyck engineers sought the system less likely to cause false alarms. The Edison system was selected by all three because of the unique design of its thermocouple-type detectors which have no moving parts and are unaffected by vibrations throughout the range from 0 to 1000 cps.

Fire detection on aircraft is a relatively new field, yet EDISON has been a leader since the beginning and is consistently pushing development of new systems for the future of aircraft safety. Send for free Bulletin AW 38A-3003.

PHOTO BY MICHAEL



**Thomas A. Edison, INCORPORATED**

Instrument Division  
141 Middle Avenue, West Orange, N.J.

MANUFACTURERS OF  
Thermocouple Detectors • Engine Gauges  
Engine Belts • Timing Belts • Alternators

YOU CAN ALWAYS RELY ON EDISON

high wing, twin engine, monoplane. Two Wright CR400 engines are mounted close together on the 14 ft. 11 in. wing. The fuselage, 12 ft. long, has the carbon steel fuselage associated with the better French aircraft. Tail surfaces are constant chord stabilizers and have tapered radials that provide leading edge in front.

Main wing structure is in three sections, a center section of constant chord and thickness and tapered, welded outer panels. Double-dotted lines of 30% wing chord are fitted, and conventional ailerons are used.

The center section spans about 79 ft., carries the two engines and is the structural portion of the wing. The removable outer panels span 34 ft.

Most of the fuselage dimensions are determined by the shape of the flight compartment which is rectangular, and according to the company's drawing, measures about 31 ft. long. The cabin is about 7 ft. wide and 6 ft. high. There is no obstructing structure within the flight compartment.

Total volume of the compartment is 1,750 cu. ft. The height of the 6 ft. square landing door is about 45 in. off the ground.

Engine arrangement of the compartment is such that either freight or normal load of freight and passengers can be carried. Another engine can be attached at even intervals to the floor and fuselage sides. There are engine rails and quick-connect brackets for attaching freight. Passenger seats are of the folding type and can be mounted and dismounted quickly.

Passenger capacity would be 16, in one row of four abreast.

Other Components—The elevator is a single piece and passing through the rear of the fuselage. At its ends are curved the vertical end surfaces.

The elevator's surface is adjustable on the ground, and control surfaces are balanced aerodynamically and dynamically.

One of the most loading gear wheels is carried by a shock strut located within a housing which is part of the wing structure. The strut wheel is mounted on a swivel on top. All wheels have low pressure tires.

Pilot's compartment is arranged for three persons. It is heated and sound-proofed. The control arrangement is in place and as part in the conventional manner. Instruments are placed on the right of the compartment, behind the cockpit.

Model 51 is being built around Wright C55 engines with takeoff weight of 8600 lb., each. Gross weight of the craft then becomes 23,750 lb., of which 10,400 is useful load.

Performance for flight-testing is given by ED as follows:

• Climb a distance of 310 mi., the craft

# EXPANSION-CONTRACTION-VIBRATION...

## Here are 3 Ways to Cure Them!

These are the right connections—wherever there's unwanted motion—or critical temperature, pressure, vacuum or corrosive action.



**TITEXFLEX®**  
All-Metal  
Flexible Hose

flexible up to conditions that would make rigid tubing. You can use it for even of tubing pipe. Connect analogous or moving parts of machinery. Absorb vibration, or pulsation. Through vacuum, fluid lines and valves against chemical or electrical interference. Resists dielectric gases, vapors or liquids—less common to be in contact to them. There's more than just an application in your plant right now this quality TITEXFLEX.



Seamless steel wires, rugged, flexible, superior for motion of fluids.



**UNIFLEX**  
Helically-Coiled  
Seamless Flexible Tube

a tough, corrosion-resistant, lightweight. Use it in applications too tough for ordinary stainless tubing. For example, oil burners, hydraulic lines, air conditioning equipment, refrigeration machinery, pumps, compressors, deaerators and medical tools. Metal-to-metal seal of UNIFLEX fittings means leakage never. Resists, resists wall structure gives it greater flexibility and longer life. Thoroughly tested in service, UNIFLEX offers real advantages where conventional tubing gives trouble.



Note the helically-coiled, seamless wall structure of bellows.



**TITEXFLEX BELLOWS**

have unique, welded, corrugated, diaphragm construction. They absorb (and absorb) in many types of equipment—without weakening lines and without inducing the flex, rattle of pump contraction and expansion or high frequency vibration. To seal high pressure valves and shafts, or to handle gases and vapors require at high temperatures. For special applications special design can be furnished. Complete bellows assemblies can be supplied with any required types of fittings.



Corrosion-free, clean, welded, corrugated, diaphragm construction of TITEXFLEX bellows.



### FOR FREE LITERATURE

check the products (below) that interest you and mail the coupon. By return mail we'll send you extensive TITEXFLEX literature, outstanding full descriptions, technical data and suggestions for use. Also if you have a specific problem, our Engineering Staff will be glad to discuss it with you without obligation.

## Let Our Family of Products Help Yours

Which product are you interested in?



☐ BELLOWS  
SEAMLESS STEEL



☐ BELLOWS  
STAINLESS STEEL



☐ BELLOWS  
BRASS



☐ BELLOWS  
COPPER



☐ BELLOWS  
TITANIUM



☐ BELLOWS  
MONEL



☐ BELLOWS  
NICKEL



☐ BELLOWS  
ALUMINUM

**TITEXFLEX, INC.**  
1317 Independence Ave.  
Harrisburg, Pa.

Please send me without obligation the products checked on the left.

NAME \_\_\_\_\_

MAIL \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_



Only the Best  
can bear this  
Crust



Island Airplane Company "G-10" — Gibson  
provides complete fuselage, wing, tail,  
engine, and interior



Major Armstrong's "G-10" supplies for Japan  
Gibson provides complete fuselage, wing,  
tail, and interior



Over South Sea, "G-10" — Gibson will pro-  
vide complete fuselage, wing, tail, and interior



Over South Sea, "G-10" — Gibson will pro-  
vide complete fuselage, wing, tail, and interior

Gibson provides complete fuselage, wing,  
tail, and interior

Gibson offers completely  
stocked, completely equipped  
aircraft manufacturing  
division.  
Write for fact-filled brochure  
on Gibson facilities and  
capacity.

**Gibson** SUBORDINATOR CO.  
GREENVILLE, MISSISSIPPI

attains, but good news was, they  
saved the seabirds, and plucked  
them out to keep out the noise when  
the jets taxed by.

Forward on tracks at the end of the  
runway complained about jets cruising  
overhead only a peak, short-time re-  
sponse of 100 db. But they didn't  
read the 95 db. the low tracks looked  
up when flying, not the 120 db. when  
over pumps were taxed.

In the audio shock, generators pro-  
duced as high as 100 db for 30 or 40  
minutes out of each hour. Operators  
found this uncomfortable but com-  
plained when jets landing and taking  
off usually ran the noise meters up to  
110 db. for very short intervals. On  
the base, the small rooms of heavy  
activity ran up to as high as 90 db.  
while jet planes overhead seldom ex-  
ceeded 80 db.

• **Conclusions**—The report concludes  
that jets can be annoying but they are  
no reason to leave the base or to  
consider aircraft maintenance noise. And  
the case on the base was no danger  
of going deaf if they were satisfied as  
plans.

## THRUST & DRAG

One of the things that worries me is  
exactly who it takes two years to get  
an airplane into production. Is it be-  
cause everybody has said so and the  
specification of that figure has become an  
accepted truth?

Listen to one of the aircraft execu-  
tives tell. His tale is that it takes two  
years because he has to get tools and  
equipment and design laid up. By  
whatever the authorities can be banged  
out rapidly, and all the backlog that  
now are because of the subcontractors  
and suppliers.

Then ask to the suppliers. They  
can't get tools and materials to build  
components or equipment or engines.



### TESTER FOR FUEL CELLS

This gas test vehicle will be used for testing  
direct fuel cells. Handling cell assemblies  
in bags to flow in testing at 52 psi bar, vacuum  
is shell in 15 ft. in diameter. 47 ft.

Then the machine tool people here  
they say. They can make tools fast  
enough, they state, if people know  
enough to order what they need and  
use the new material handling and as-  
sembling system.

If it is the services who need to find  
my building the particular tool. And  
they can't really be blamed too strongly  
because they have to hold pretty much  
to a budget limit imposed on them by  
Congress.

And Congress, at everybody knows,  
is the elected conscience of the people.

As to those who can contribute  
and the difficulties of the new kinds of  
assembly, let them consider the way  
Kelly Johnson managed the Lockheed  
XP-40 job. From conception to first  
flight took 345 days, as fast then as  
a new. And the job that Kelly and his  
staff faced was just as favorable as the  
tasks which are confronting design  
today.

It seems to me somebody had better  
get on the ball and do some top-level  
thinking about this. It's bad enough  
not knowing what kind of airplanes we  
ought to build and who should build  
them, but alone not knowing how long  
it should take to build them.

\*\*\*

The Muscard Machine Tool Co.,  
Salmon, Ohio, makes (the firm says) the  
first hole in the world. The firm also  
makes one of the finest efforts that I've  
seen to attract young engineers. It's in  
the form of a booklet called, "It's your  
future." "and it gives briefly the story  
of Muscard, the company pattern for  
engineering employees, financial status  
and description of Salmon. The presen-  
tation is lively, with little spot statistics  
on the origin, continuing work with  
change photos to illustrate the fact. It's  
worth a look, and the Muscard people  
probably would be glad to send you a  
copy if you have a good reason for  
asking.

—DAA



at the GLENN L. MARTIN COMPANY...

it's the REMINGTON

*Electric-economy*

typewriter for their

CORRESPONDENCE  
SPECIFICATIONS BLUEPRINTS  
CHANGE ORDERS BILLS OF MATERIALS  
PARTS LISTS  
MATERIAL REVIEW REPORTS  
QUALITY CONTROL LOGS  
GROUND AND FLIGHT LOGS  
DATA SUMMARIES



Remington Electric-economy Typewriter  
at work at the Glenn L. Martin Co.

**Remington Rand** THE FIRST NAME IN TYPEWRITERS

A veritable stream of paperwork starts flow-  
ing the very second Glenn L. Martin Com-  
pany receives a contract to design and build  
a plane. Preparing all this paper may well  
be compared to the actual building of the  
plane. Standardization, quality, economy,  
accuracy and interchangeability are all of  
paramount importance. That's why you will  
find Remington Electric-economy typewriters  
at work throughout the Martin plant in  
Baltimore.

Increased typing production... hand-  
some, uniform typewriting... 10 or more crys-  
tal clear carbon copies at one typing...  
sharp, clean stenography... and a new high in  
operator morale because of the winning  
electric ease of operation are just a few of  
the many Plus-Values to be experienced  
with the Electric-economy.

Send for your booklet, "TAKE A LOOK"  
(RE 8400). Address requests Box 2300,  
315 Fourth Ave., New York 10.





## PRODUCTION

## Subcontractors Build Half the P2V-5

- This typifies Lockheed plane production now.
- About 4,000 subs help build firm's aircraft.

Lockheed Aircraft Corp. is putting the push on its subcontracting. This year, its subcontracting program has been expanded 21.4% so that now 97 different assemblies or major parts of Lockheed planes are made by others. Total of subcontracting is about 30% of all Lockheed production.

For the company's Navy F4V-3 Neptune, 51% of the plane is built by others, but so is its other military jobs, fewer than are subcontracted. In any case, 41.5% of the F4V is handled outside in against 39% for the T-33. For the new F-94C Starfire intercepter, 51.2% of the machine job will be subcontracted. On its Super Corsair two-boft commercial and military—lockheed don produce the entire job.

★ **Money Involved**—Value of this large-scale contracting for Lockheed-California operations represents \$255-million worth of contracts—more than half of company's \$496 million of total orders for purchase of aircraft components and allied items. (The company also is setting up the USAF facility at Mesquite, Ca., to build Boeing's B-747.)

• **Who's Participating**—The nine companies producing engine assemblies for Lockheed include Cessna Aircraft Corp. and Beech Aircraft Corp., Wichita, United Aircraft Corp.'s Cessna-Vought division and Texaco Aircraft Corp., Dallas; Kaiser Mfg. Co., Oakland; Caltex, Boker Aircraft Corp. and Solis Aircraft Corp., San Diego, Calif.; and Rheem Mfg. Co. and Industrial Fibertex Co., Los Angeles, Calif.

In addition to these major roles, there are about 4,000 others in the entire group of vendors and outside producers.

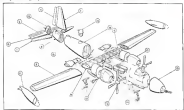
► **Prerequisites**—What is involved in a subcontracting program is highlighted by what Lockheed had to do to start the program for the F35.

- Recode about 15,000 aircraft parts and assemblies
- Recode about 30,000 shop orders to provide a catalog of parts and permit transfer of orders

- Transfer 15,000 individual tools to sales. Some features needed manual steps.



FBI WIND being unloaded from special van at Lockheed's Van Nuys, Calif., plant, considered lost from inventory after crash. Bock Aircraft Corp., Wichita.



FROM PRODUCTION MGMT. GROUP

what parts are made by others for each level: 1, stabilizer; 2, fus, 3, elevator and tab; 4, radials and tab; 5 aft fuselage; 6 variable number assembly (Parts 1 to 6 made by Chrysler Vought); 7, outer wing and tips (Jensen); 8, wing body structure; 9, outer section flaps (Parts 8 and 9 by

Keen 3899, 18, pericarpal package, 21, lip scarlet G1 and G2 in Kuhl, 12, a gas inside berries (Sohn), 13, fragrance (Klewin), 14, dark red (Industrial Fabrics), 15, want and tail gas berries and 16 purpleberry pericarpal package. Looked buds forward and onto face big yellow and some very (Mith)

Pioneered by Gilfillan



first. GCA Editor

developed by GIBCO is collaborative with the National Laboratory of Health and World War II. The war's most complex code development. The original GIBCO CCA weighed 10 lbs, reduced a 3 min assay



first. And some

and exclusively the product of GAD65 research. This 3 dimensional map shows profiles of the overall population, healthy and aged range. And changed GAD65 codes from a free test to a certified one more accurate

1947  
first. MD

The GillNet developed among Target Industries eliminated general duties, and used a balance combination of a special coffee expenditure-share provision of a credit subsidy to all C&A users concerned.



first, ECA "Thanking"

Efficient solid waste management in the field has resulted in many operational and technical improvements such as the present compact desktop DCA console, compared to the 20-litre portable reader.



today's **business** **today**

— is the only GCA now proven and in operation in both U.S. Civil and Military airspace. It extends search coverage to 10,000 feet altitude over a 50 mile radius — a twenty-fold increase over original GCA surveillance.

tomorrow's *Radio Development*

— now in progress on Gillies — further GCA improvements — offer top secret projects in varying stages . . . research, design, mock-up, production. In radar, now as for four decades past, the first name is Gillies.

In QCA and Radar  
analysis, design and production

—the FIRST name is

*Gilfillan*  
Los Angeles

Los Angeles

## ENGINEERS & SCIENTISTS

You are invited to write regarding positions in our long-range projects at Northrop Aircraft, Inc. Exceptional opportunities now exist for you in engineering and scientific and technical jobs. Join K. Northrop, Inc. qualified, you may select important developmental work, or equally vital production engineering.

Examples of positions open are:  
ELECTRONIC PROJECT ENGINEERS  
ELECTRONIC INSTRUMENTATION ENGINEERS  
RADAR ENGINEERS  
FLIGHT TEST ENGINEERS  
ARMED ENGINEERS  
ENGINEERING DRAWING ENGINEERS  
AERO AND AERODYNAMICISTS

SEVERAL-EMPLOYEES: POWER PLANT INSTALLATION ENGINEERS  
STRUCTURAL ENGINEERS  
ELECTRO-MECHANICAL ENGINEERS  
ELECTRIC INSTALLATION ENGINEERS

Qualified engineers and scientists who wish to locate permanently in Southern California are invited to write for further information regarding these interesting, long range positions. Please include an outline of your experience and training. Allowance for travel expenses.

Address correspondence to:  
Director of Engineering,  
Northrop Aircraft, Inc.,  
1002 E. Broadway,  
Hawthorne, California

# Scramble!

**Northrop Aircraft, Inc.**  
Hawthorne, California

Pioneer Builders of Night and All-weather Fighters

- Designing and building aircraft as much as 11,000 lbs.
- Saving \$80,000 on delivery parts and assemblies to take to fully armed production.
- Translating \$4-million worth of new machine tools.
- Preparing and maintaining 375 course books and 455 manuals covering production and process specifications, assembly charts, and other engineering and manufacturing data.
- Incorporating about 2,400 design changes in engineering on the aircraft production line.
- Developing specially designed tools and fixtures to take completed F-2V assemblies.

## Council to Push Production Progress

Aircraft industry production and plant-operation executives and manufacturers' executives will be interested in the workings of the newly formed council for Technological Advancement in the Aircraft Industry (TAAI).

The council will promote, protect and promote what is known as the "TAAI".

- Exchange and promotion of engineering ideas in plant modernization and construction, alternative production methods etc.
- Technological trends and new technology products and materials.
- Equipment leasing and financing to



BELL'S BIG GUN

For flexibility and versatility during final testing of Boeing B-707 engine nacelle test stand and fuselage, Bell Aircraft Corp., Bellville, N. Y., developed this novel "jigging" system. Cross-sectional, the unit can move between a 90° line. Chosen at standard and special size points while in use, aircraft engine and test angles. The unit being assembled is mounted on a rotating base fixture.

- speed acquisition of new facilities.
- Inter-industry and inter-company collaboration on economic and industrial research.
- Reduction of barriers to technological development.
- Marketing of industrial equipment.
- Mass education of industry on capital goods economics.
- Economic measurement of effects of changing value of the dollar on industry's equipment depreciation and replacement policies.
- Measures which may be taken by industry to allocate cycles of demands for capital goods.
- Education of industry on capital goods economics.

Programs of the Council will be under the guidance of a board of trustees composed of 35 industrial executives of companies particularly identified with technological advancement. General headquarters will be in Manhattan and Allied Products Institute's offices—130 S. LaSalle St., Chicago, Ill.

## PRODUCTION BRIEFING

► Aerodynamics division of General Motors Corp., Detroit 1, Ohio has received its new engine for test stand checks of its production. One is a Wright R3400-51 compound engine for testing propellers, and the other is an Allison C119C and C119D. The other is an Allison C119C compound propeller for checking propellers for Cavay R37 Douglas A1D and North American A1J.

► Allis-Chalmers Mfg. Co., Los Angeles, has moved to larger quarters in a new building at 9225 Wilshire Boulevard, keeping all its engineering staffs there under one roof. The single-story structure contains 77,000 sq. ft. of floor space.

► Allied Products Engineering Corp., Los Angeles, has been named City form representative for plastics and allied products made by Chloride Development Corp., Broomfield, Mass.

► Berlinger Corp., Watrous, Mass., has purchased Tishco Foresters Forest Products Co., Ohio. The new division is expected to move into the field of economic coatings of other metals for high temperature applications in jet and piston engines.

► Dayton Rubber Co., Dayton, Ohio, has purchased Tishco Foresters Forest Products Co., Los Angeles, a major supplier of firm rubber products to West Coast aviation firms. American Latex will be operated as a division of the parent firm.

## TRACEABLE DRAWINGS



...OF  
Flush  
Latches  
AND  
Hinges

## another HARTWELL SERVICE

Specialty prepared full size traceable drawings at all HARTWELL, Flush Latches and Hinges are now available to aircraft designers and draftsmen. Request a complete list. They will be sent to you free of charge and without obligation. The HARTWELL policy of serving the needs of aircraft engineers and the industry includes the design and production of a complete line of flush latches and hinges for every aircraft application.



Write for new  
Flush Latch and  
Hinge Catalog

## HARTWELL AVIATION SUPPLY COMPANY

9500 Venice Boulevard, Los Angeles 24, Calif.  
Branch Office: Wichita, Kansas

Manufacturers of:  
HARTWELL CABLE TERMINALS  
HARTWELL AIRCRAFT FITTINGS





**BLOCK DIAGRAM**  
**SIDESLIP STABILITY AUGMENTER**

The diagram illustrates the control system for a Sideslip Stability Augmenter. It features several interconnected blocks and components:

- ROLL RATE**: The primary input signal.
- ROLL RATE SENSING**: Receives the input and provides feedback.
- ROLL RATE INTEGRATOR**: Processes the sensed roll rate.
- ROLL RATE LIMITER**: Limits the integrated signal.
- ROLL RATE CONTROL**: Generates the control signal based on the limited input.
- ROLL RATE ACTUATOR**: Converts the control signal into a physical output.
- ROLL RATE ACTUATOR**: The final output of the system, which is fed back to the sensing block.

Additional components shown include a **ROLL RATE SENSING** block, a **ROLL RATE INTEGRATOR** block, a **ROLL RATE LIMITER** block, a **ROLL RATE CONTROL** block, and a **ROLL RATE ACTUATOR** block.

Avionics Damper Steadies F-89

By Philip Klutznick

The system, called a ridepath stability segmenter, also makes the F-90 essentially a two-control airplane in which the pilot almost never uses his rudder pedals.

• **Special Features**—The new Northrop development is noteworthy because it is the first aircraft to be designed and built out of phase. The "Dutch Red" term derives from its similarity to the scheme of a Dutch's head.

- Uses a sensitive accelerometer instead of the commonly used rate type gyro
- Has an integral compensator which varies the degree of damping action at different speeds and attitudes.

\* Provider designed to maneuver as well as in straight and level flight, a feature not found in some systems.

- *Climb* automatically, at any speed, without pilot rudder pedal action.

The Northern development is also attempting to advance of a trend by some offshore manufacturers to assume wider responsibility for services equipment which directly influences the living characteristics of their offshore. In some cases, like at Northern, the offshore manufacturer then subcontract the actual onshore production to its onshore manufacturer.

• The Nerd-In practically all of today's high-speed jet fighters and bombers, the zero-summer has had to sacrifice lateral stability to obtain the desired maneuverability. As a result, a great disturbance can set up a lateral-directional oscillation in which the rolling and yawing maneuvers are linked out of phase. The "Dutch Roll" term derives from its similarity to the motions of a ship's hull.

Dutch Roll is severely discomforting to a pilot during cruise conditions. It is even more serious under combat conditions where it makes the pilot a very unstable gun platform.

The current trend to rockets for lighter aircraft raises another problem. A rocket fired from a moving airplane will head into the relative wind, regardless of the heading of the airplane at that instant.

Any airplane sidslip at the instant of firing will cause the rocket to veer from the pilot's aiming point, possibly missing the target. The angle of rocket deviation is roughly equal to the sidslip angle. Northrop has eliminated this source of aiming error with its automatic system.

• **No Rudder-When** the pilot wants to turn, he simply deploys the ailerons, the ailerons automatically introduce the necessary rudder displacement to coordinate the turn (eliminate sideslip). According to D. T. McNair, head of Northrop's new engineering section which developed the ailerons, the turn is coordinated at all speeds.

The two control, no-molded operation is essentially a useful byproduct which is excluded because it adds practically no weight or constraints.

A water-driven screw actuator operates the miller through the Northern Hydroflex power boost system to introduce segmenter action. The screw is connected through a linkage which prevents actuator load added once screw starts from being transmitted back to the water's roller wheels.

The car can dip or dial the 7.99 if he drives this example to show himself by applying a light pressure on the rudder pedal and against the normal deflection. The 12 officer contributes the action of the magnometer. Actually the magnometer curve will be working at zero purposes to the pilot's action until the curve reaches the limit of its travel (assumed to be the rudder-travel). The pilot doesn't feel the magnometer curve counter force. It merely serves to hint that he has to push his rudder pedal further (not not harder) to obtain the desired degree of rudder action.

**How It Works**—McRae explains aerometer operation by comparing it with the pilot's normal reactions and perceptions. "When the pilot sees the ball in his bank indicator is not too sensitive (accelerometer) move off center, he makes appropriate input. The faster the ball moves, the faster he pushes on the pedals. The aerometer operates in similar fashion," McRae says.

The back indicator function in the semivariogram is performed by a Northern *Decapoda* crustacean with extremely

UNIVERSALLY ACCEPTED

the largest  
resistance welding  
machine manufacturer  
in the world

**SEI AKY.**  
4815 West 67th Street  
CHICAGO  
Plants at London, Paris

# Airloc

sticks its neck out  
for SAFETY

You can see when Airloc is not fastened, its head sticks up as a warning. A quarter turn of the head and you have the pressure-locking fastener in sight, both ends and self-closing action keeps it locked even under extreme vibration, compression for variations in elastic thickness. Flush or recessed head type for cowling, fairings, inspection plates, etc., wing and tail ring types for interior installations. Full range of sizes and special designs. Catalog on request.



Monadnock, with a wealth of factory experience, also performs repairs from manufacturing reliable development and production facilities.



Made to conform to  
United States Air Force  
Specification MIL-P-5577.

Simple 3-piece construction  
— no nuts, and nut pin



ACCELEROMETER is among most of  
Northrop safety devices suggested.

high intensity. It is installed near the airplane's center of gravity. In straight and level flight, no change is indicated; sideways attitude causes a side-ward component of force to be applied to the airplane, giving it a lateral acceleration.

The magnitude of the lateral acceleration measured in this position is proportional to sideward angle, but small angles. Thus the a.c. signal generated by the accelerometer is proportional to the sideward angle and hence a measure of the amount of sideward motion to which the airplane is subjected.

During banking turns, the accelerometer recognizes the lateral and compensates for gravity and centrifugal force. If the two are not equal, the accelerometer generates a signal calling for sideward displacement to compensate the turn.

► Sensitive Accelerometer—The Northrop accelerometer is essentially an accelerometer which is generally filled with an electrolytic liquid. It contains two of the finest and most accurate accelerometers in the world's range. The device's construction is not unlike that of electrolytic switches used to detect vertical g-forces (Aviation Week July 14, p. 57).

When lateral acceleration is zero, the electrolyte is neutral and produces equal currents from a center electrode through two electrodes, one located at either end of the accelerometer. When the device experiences a lateral acceleration, the electrolyte shifts position, reversing current flow to one end electrode and decreasing it at the other.

The direction of the acceleration is determined which end electrode carries the larger current.

► Linear Output Required—Accelerometer sensitivity was not the only problem involved in designing the system. Northrop needed a size-of-change-of-sideways signal for use in stabilizing the servo system and determining if time a second which takes the first derivative of the sideways signal (flaps the accelerometer). However this imposes a severe linearity requirement on the accelerometer, i.e. the output signal must be proportional to lateral accelera-



MODEL 10421



MODEL 10422



MODEL 10423



MODEL 10424



MODEL 10425



MODEL 10426



MODEL 10427

## ARO OXYGEN REGULATORS

Meet All Aircraft Requirements!

ARO Two-Stage Automatic Constant-Flow Oxygen Regulators are precision-made to provide better performance... simplified servicing. All models are variants of a basic regulator, Model 10409, and will give specified performance on inlet pressures of 50-2600 p.s.i. These models cover all currently known installation requirements. Models can be furnished with output performance according to Civil Aeronautics or Type A-11 specifications.

ARO has modern facilities and years of know-how in producing high-precision aircraft products. Adequate facilities for servicing oxygen equipment are as close as your nearest phone. Write or call... The Aro Equipment Corporation, Bryan, Ohio.



### AIRCRAFT PRODUCTS

Vacuum Pumps, Oxygen Regulators, Air and Oxygen System Accessories



MODEL 10410



MODEL 10411



MODEL 10412



MODEL 10413



MODEL 10414



MODEL 10415

**INSTANT  
AUTOMATIC  
FLOW**

Look First  
Minimum Water  
Galling Risk

Looking into it - Handles  
Push-Tight Coupling Index  
affords large inner  
clearance with plug  
disassembly permitting  
water and solvent  
entry. No leak.

**WHY  
Genuine  
HANSEN  
COUPLINGS  
GIVE BETTER SERVICE  
LAST LONGER**

**PICK GENUINE HANSEN COUPLINGS  
FOR HANSEN PERFORMANCE...**

► To connect a Hansen coupling, you merely  
push the plug into the socket with one hand.  
Flow is instantaneous. To disconnect, pull back  
where an actuator-coupling disconnects flow in  
this oil instantly and automatically.

Offer for catalog giving complete range of types and sizes.

**QUICK  
AND  
CORRECTION**

Large  
Factory Assembly  
Simple Fast  
Quick Seal

AL PHOENIX  
BIRMINGHAM  
CHICAGO  
CINCINNATI  
CLEVELAND  
DETROIT  
INDIANAPOLIS  
LOS ANGELES  
MINNEAPOLIS  
NEW YORK  
PHILADELPHIA  
PITTSBURGH  
SAN FRANCISCO  
ST. LOUIS  
WASHINGTON  
WICHITA

ALBANY  
ALBUQUERQUE  
ANCONA  
ANN ARBOR  
ATLANTA  
AUSTIN  
BOSTON  
BUFFALO  
CALIFORNIA  
CHICAGO  
CINCINNATI  
CLEVELAND  
DETROIT  
INDIANAPOLIS  
LOS ANGELES  
MINNEAPOLIS  
NEW YORK  
PHILADELPHIA  
PITTSBURGH  
SAN FRANCISCO  
ST. LOUIS  
WASHINGTON  
WICHITA

ALBANY  
ALBUQUERQUE  
ANCONA  
ANN ARBOR  
ATLANTA  
AUSTIN  
BOSTON  
BUFFALO  
CALIFORNIA  
CHICAGO  
CINCINNATI  
CLEVELAND  
DETROIT  
INDIANAPOLIS  
LOS ANGELES  
MINNEAPOLIS  
NEW YORK  
PHILADELPHIA  
PITTSBURGH  
SAN FRANCISCO  
ST. LOUIS  
WASHINGTON  
WICHITA

Based on Department of Defense

**THE HANSEN MANUFACTURING COMPANY**

1031 WEST 15th STREET • CLEVELAND 11, OHIO

## Building the World's Best Aircraft...



For example, the  
**MARTIN 4-0-4**  
is the assembly line of the  
Glenn L. Martin Company,  
Baltimore, Maryland

The new Martin 4-0-4 is a 40-passenger luxury airliner which has many modern comforts, design and maintenance features including: pressurized cabin, retractable passenger escape ladders, wing-folding system, extra large windows, rear wing of wing and tail sections and propeller blades, retractable propellers and powerful new 2000 hp Pratt & Whitney engines.

There is Reynolds Aluminum in almost every airplane that flies today.  
The aircraft industry has learned to de-

pend on Reynolds for consistently high quality and economical and workable guidance of development and engineering. Reynolds completely coordinated experience, from the making of aluminum to the delivery of aluminum in all its forms, assures dependability of supply. And, moreover, as the aircraft industry expands and grows, Reynolds Metal Company keeps pace in supplying and developing aluminum—the design metal of today, the production metal of tomorrow.

## Helpful Material for Your Training Program

Reynolds Aluminum is on the job with literature and movies to help you with your personnel training program—add to your own knowledge. This complete library of Reynolds Technical Books on aluminum design and fabrication is available to you for the asking. Please send your request on a business letterhead, otherwise the price of each book is one dollar.

- **A B C's of Aluminum**—Given in 16 to 17 minutes
- **Aluminum Data Book**—Questions asked and answered
- **Aluminum Design Basics**
- **Designing with Aluminum Structures**
- **Forming Methods for Aluminum**
- **Foundry for Aluminum**
- **Forming Aluminum**
- **Heat Treating Aluminum Alloys**
- **Machining Aluminum Alloys**
- **Welding Aluminum**
- **Aviation Weight Data Book**

And to interest these persons of tomorrow to get closer interest in your training program—get these films, also used throughout Reynolds Film Service.

- **QUALITY OF DESIGN TO COME**—Learn the development of aluminum structures process and the design opportunities it presents. Running time 30 minutes.
- **USE OF THE EXPANDED FIN**—Emphasizes its economic power and points out the design applications in production and inspection. Running time 22 minutes.
- **POST AND PROGRESS**—The complete story of aluminum takes you to finished products. Covers all types of aluminum. Running time 20 minutes.

Write to Reynolds Metal Company, 3229 South Third Street, Louisville 5, Kentucky



# REYNOLDS ALUMINUM

WORKS DESIGN HAS ALUMINUM IN MIND



FRANZFULER was a one of the components Minneapolis-Honeywell makes.

tion within very close limits.

McFadyen says the honeycomb requirement has been met in the past few days. Changes in aircraft engines have which would improve about the accelerometer a great deal have been recognized but as an engine, but unchanged method.

**Optimum Shapeup**—The accelerometer signal is immediately converted into a signal in a small pre-amplifier which also generates the rate signal previously cited.

The gain of the pre-amplifier, and the rate of rate/acceleration signal read, is determined by an integral compensator. This device contains several feedback components which is varied to the sense and pilot level and which drives the rate transducer.

Two of the pins are used in comparison with the pre-amplifier, the third is used to receive coordinated turn at all angles. The tapered compensator enables the amplifier to provide optimum damping throughout the altitude and speed range of the aircraft.

**Servo System**—The remainder of the servo system is conventional. Northrop uses a standard servo amplifier and servo actuator which will be also producing for the Boeing B-47 low drag.

The servo amplifier converts the electrical output of the amplifier to a v.c. signal using a small amplifier. The signal is then modified and applied to one phase of a two-phase a.c. motor in the servo actuator.

The servo actuator has a follow-up accelerometer which provides a feedback signal to the rate amplifier. The actuator also drives a small rack pinion to provide a v.c. rate

FOR SAFETY AT HIGH ALTITUDES

## COMPLETE ALTITUDE TRAINING FOR PILOTS AND GROUND PERSONNEL

For the first time complete altitude indoctrination for pilots, flight crew and other personnel, as well as a related program for airline stewardesses is available.

Additional training programs for ground personnel including engineering, inspection, test, installation and servicing personnel are being conducted. Altitude, Inc. is the first to offer such a program for personnel indoctrination and technical training in all phases of aircraft oxygen systems.

Write for complete information



Altitude, Inc. has a facility in a specially designed building, complete with all the facilities necessary for altitude training. The facility is located at 109 Skidlen Street, El Segundo, California. Phone: (213) 742-2222.

**ALTITUDE, INC.**  
New Branching in Our Success

109 Skidlen Street, El Segundo, California • Phone: (213) 742-2222

## When you think of STAINLESS STEEL FASTENINGS think first of ANTI-CORROSIVE



Anti-Corrosive has millions of stainless steel fastenings in stock for immediate delivery—plus a complete inventory of stainless steel fastenings ready to meet all your requirements beyond stock items—faster, better!

FRS—Write for Slide-Guide 112 which instantly identifies A.M. no. pertaining to stainless fastenings.

25 YEARS OF LEADERSHIP IN STAINLESS STEEL FASTENINGS

**Anti-Corrosive**  
Metal Products Co., Inc.  
Manufacturers of STAINLESS STEEL FASTENINGS  
CASTLETON ON HUDSON, NEW YORK

**AN Fittings  
Special Fittings  
Flexible Metal Hose  
Assemblies  
Silicone Rubber Hose  
Assemblies**

**We will be pleased to quote on all AN Fittings and special aircraft components. Write or phone for further information.**

**AIRCRAFT  
COMPONENTS  
DIVISION**

**DUNBAR KAPPLE Inc.**  
405 N. River St. Batavia, Ill. Phone Batavia 5400

**Sales Offices**

11 E. Green St.,  
New York, N.Y.  
Area Office

1271 Condit Avenue  
Baltimore, Md. 21204  
Telephone BR 1-1000

400 Thompsonville Blvd.  
Cincinnati, Ohio 45224  
Telephone 621-1000

12-124th St., Phone 100  
Minneapolis, Minnesota 55416  
Lambert 2-4200

1901 Edison Building  
Chicago, Ill. 60612  
Area Office

1701 Michigan Avenue  
Cleveland, Ohio 44115  
Area Office

10 E. North Ave., North  
Saville, N. York 10510  
Area Office

signal which is introduced through the outside of the first stage tube in the servo amplifier.

► **Cross Control**—Although the servo amplifier could provide a signal to call for rudder needed to coordinate a turn, the device substitutes a rudderless low G turn. If the system dependent solely upon the accelerometer is called for rudder during a turn to overcome adverse yaw due to the ailerons, the plane might walk in an uncoordinated turn for the first few seconds.

Northrop gets around this problem by using a small push-button follow-up assembly which is driven from the aileron control cables. Displacement of the aileron rudderless generates a d-c signal which is introduced between the pre-amp and the servo amplifier to call for displacement of the rudder.

The aileron follow-up signal is also necessary under steady-state turn conditions to back out the follow-up signal from the displaced rudder.

Because the mixing of rudder displacement required for turn coordination runs counter with increased the servo guidance of the aileron follow-up post is varied from a potentiometer in the servo control computer. Rudder turn can be introduced by inserting a potentiometer on the aileron aileron which reacts a d-c signal between the pre-amp and servo amplifier.

► **Guidance**—Northrop and Minneapolis-Hawthorne have worked very closely on the F-58 autopilot program, according to Don McMillan of Northrop's servo-mechanisms section. For example, two Northrop engineers spent several months in Minneapolis working on the aerodynamic design of the accelerometer and associated computer with M-H engineers.

To speed up the program, Northrop has used existing M-H components such as the servo amplifier and servo actuator. The pre-amplifier, however, was developed originally by Northrop specifically to work with the new accelerometer. M-H provided the initial Northrop design to adapt it to Minneapolis-Hawthorne's production line techniques.

Northrop engineers indicated that it should be possible, by redesign, to reduce signature versus weight somewhat.

This is shown to be the first design of a complex system.

While Northrop didn't indicate what direction this redesign could take, as aileron was would be to use a smaller servo motor and servo amplifier new value on the rudder power limit criteria.

► **Feed of the Feedback**—The vector plot a feedback loop at the autopilot in action, at least in a synthetic case



**You'll be proud to say**

**"I'm a  
BOEING  
engineer!"**

For 35 years, Boeing engineers have pioneered outstanding designs for both civilian and military aircraft. During the last war, the B-29 and the B-29's descendant, Boeing's bomber fleet, today the Air Force has no effective aerial force in the world Boeing B-57 Strategic medium and the new eight jet B-70 Strategic heavy bomber class alone.

You'll be proud to work with the men who designed and produced these new technology, multi-engine airplanes. You can give them no better work in this jet business—and on such challenging, long range projects as nuclear powered aircraft, guided missiles and other space programs.

There are openings in Boeing right now for experienced and junior engineers in all fields, for example:

- DESIGN     • REPAIRMENT
- RESEARCH     • INSPECTION
- TOOLING

also for servo-mechanisms and electronic design and analysis, and for physics and mathematics with advanced degrees.

Work and live in the Pacific Northwest in Seattle, or in the Midwest in Wichita. Boeing provides generous salary and benefit advantages, offers paid travel training and a salary that grows with you.

You'll be proud when you say, "I'm a Boeing engineer!"

Write today for a bulletin below or for an open

**JOHN C. SANDERS** (2nd Captain—Retired)  
Dept. 4-1  
Boeing Aircraft Company, Seattle 14, Wash.  
Engineering opportunities at Boeing include all phases and no further education.  
Name \_\_\_\_\_  
Address \_\_\_\_\_  
City and State \_\_\_\_\_

**FAST...economical assembly of motors, gear trains, electro-mechanical computing and transmission devices with mechanical development apparatus**

Servomechanisms, Inc., versatile Mechanical Development Apparatus is intended for numerous applications in the research, instrumentation, and servo control fields. Typical applications of these precision built components include analog computers, signal generators, process programmers. . . Assembly is made with standard tools... each component is designed for repeated use.

Fourth in Series: Rotations  
Measuring and Control Units  
Rotations: First, Second and Third  
First step: Coupling and control, etc.

**A typical development assembly including servo motors and synchros.**

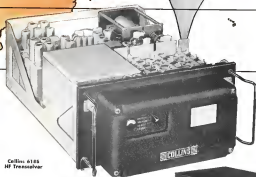
**SERVOmechanisms INC.**  
PIONEER FUNCTIONAL CORPORATION

Write for Descriptive Literature MQA-200

NEW CASTLE, NEW YORK • POST & STURGEON AVENUE, WESTBURY, N.Y. • 60 BEADING, CALIFORNIA



a voice to be heard **ROUND THE WORLD**



Collins 618S  
HF Transceiver



Collins 180L-2 Antenna Tuning Unit  
(Also used with Collins 618S and 180)

#### SPECIFICATIONS

**SIZE:** 1½ ATR TRANSCIVER  
**WEIGHT:** Approximately 35 pounds, which includes both Transceiver and Power Supply  
**TUNING:** Internal circuits automatically tuned after insertion of crystal  
**POWER OUTPUT:** 100 watts phone and CW  
**INPUT VOLTAGE:** 28 volts DC and 430 cycle, 115 volts AC  
**First** airborne Transceiver to use mechanical filters.

## The NEW... Collins 618S 144 Channel HF Transceiver

**Up To 144 Channels — 2 to 25 megacycles**

**100 Watt Power**

**Automatic Operation**

The Collins Radio Company takes pride in announcing the 618S HF Transceiver as a long awaited successor for overseas operations to the Collins 180S Transceiver now being used everywhere in the air. The 618S is designed primarily to meet the requirements of the many commercial airlines engaged in interchange agreements and international operations. Its 100 watt power is proven completely adequate for domestic and overseas operations.

The 180L-2 antenna tuning unit matches the output of the 618S to standard aircraft antennas and

guarantee peak performance on ALL frequencies under ALL operating conditions. Another advanced design feature is the use of the Collins mechanical filter in the IF circuit which provides maximum adjacent channel rejection.

Every engineering effort has been directed toward assuring the utmost in dependability, ease of maintenance, and the elimination of ground adjustments formerly necessary to implement a frequency. No coil changing — no tune-up required — modular type construction is used, and the units are plug-in type for ease of servicing and maintenance.

*Write Today for Complete Details*

For Engineering Excellence in Airborne Communications, It's...

**COLLINS RADIO COMPANY, Cedar Rapids, Iowa**

11 W. 42nd St., NEW YORK 36

1920 Carpenter Blvd., DALLAS 5

2700 W. 100th Ave., MINNEAPOLIS



Northrop uses a full-scale model of the F 59 control system which includes control surfaces, cables, power boost and sequencer systems. The device, which fits a large room, simulates the airplane in flight through the use of electronic timing computers (Aeronautics Week May 28, 1951, p. 34).

An ingenious Northrop device compensates for time lags between a projector made it possible for the motor to sit in the pilot's seat, "feel" the stick up, and see projected in front of him a complete mock-up of the plane's bank angle, rudder displacement, side slip angle, etc.

A Northrop Aircraft engineer reads

and a mechanical projector to set aside the time lags between and project these eye movements on the chart paper on the screen.

A sharp lack in the flight simulator motor (imbedding a grid) caused the F 59 simulator to oscillate until the Northrop sequencer was turned on. Then the oscillation was almost instantly damped out.

During maneuvers, with the sequencer on, side-slip displacement was needed to make a coordinated turn without the sequencer action, side-slip oscillations developed unless the motor accelerated in operating the rudder pedals.



### Digital Plotter Gives Step-by-Step Record

A digital plotter which charts a graph of one variable against another in incremental steps in response to electrical impulses from an electronic digital computer is differential analysis has been announced by Logicon Research Co. The device, called the Logicon Digital Plotter, can be used to plot any intelligence in which the variable changes in discrete steps.

The plotter has a ballpoint pen to record on either a 12-in. wide continuous strip or on a 24-in. sheet. The device permits simultaneous movement in X and Y axes along both the X and Y axes at rates up to 20 steps per second. Plotting requires no be taken from switch to other controls. The plotter contains its own power supply and operates from 110 volts ac. Logicon Research Co., 141 South Pacific Ave., Redwood Beach, Calif.



### Signal Generator Has High Stability

A new accurate signal generator is available which covers the range of 7,000 to 10,750 megacycles and can provide either pulse or frequency modulation, with either delayed or undelayed switch signals. The generator is well known to high stability, to assure accurate measurement. Called the Model MSC-4, the signal generator provides single direct-reading dial control of frequency and uses non-contacting shutters on the klystron cavity.

Patented Electronics Corp., 680 Metropolitan Ave., Brooklyn, N. Y.

# Aircraft Parts by Eaton

## combine outstanding developments in design, metallurgy, and production engineering



Since pioneering the development of the sodium-cooled valve in cooperation with the Army Air Force at McCook Field in 1922, Eaton has made many important contributions to the aircraft industry in design, metallurgy, and production. Eaton's understanding of the problems peculiar to the aircraft industry has led to the development of unique, high-volume production facilities for the manufacture of parts which meet exacting aircraft standards of quality.

### EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

SAGINAW DIVISION: 971 FRENCH ROAD • DETROIT 13, MICHIGAN



PRODUCTS: Sodium Cooled, Poppet, and Flare Valves • Rapports • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Petroleum Mold Gray Iron Castings • Master-Glinder Units • Snap Rings • Spring Washers • Cold Chilled Steel Stampings • Leaf and Coil Springs • Dynamic Drives, Brakes, Dynamometers

**The Queens of the Air Depend on STEEL TUBING**

FOR A SUPERIOR SUPPLY OF

**Aircraft Tubing**

**SERVICE STEEL Div.**  
VAN DYKE CORP.

1000 PLUMMER ST. SAGINAW, MICHIGAN 41301  
SAGINAW DIV. 971 FRENCH ROAD, DETROIT 13, MICHIGAN

WELLS, MICHIGAN 41301  
WELLS, MICHIGAN 41301



## EYES OF *FLIGHT*

Eyes of flight—the PLEXIGLAS canopies, domes, noses, windows on today's fighters, bombers, transports, helicopters. Through these transparent shields against wind and weather, the men who fly our country's planes obtain their all-important unobstructed view.

Some of these PLEXIGLAS enclosures are monolithic, some are laminated. Many are formed from PLEXIGLAS II UVA, the approved grade of this acrylic plastic, with its increased resistance to heat, weather, and crazing. All of them have the clarity, strength, light weight, formability, dimensional stability, and weather-resistance that have established PLEXIGLAS as aviation's standard transparent plastic.

To make the most efficient use of PLEXIGLAS in aircraft applications, call on the Rohm & Haas service staff and technical representatives. Their services are backed by years of close cooperation with the aircraft industry and the Air Materiel Command.

Plexiglas is a trademark, Reg. U.S. Pat. & TM. Office and other principal members of the Rohm & Haas Company.

Corporate Headquarters: Crystal City & Planting, Ind. 46015. Sales & Service Offices: 1000 North 10th Street, Philadelphia, Pa. 19107.

UNIFORMS

FOR IMPURITY

**PLEXIGLAS**

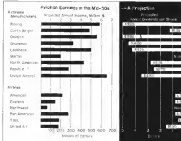
**ROHM & HAAS  
COMPANY**

BRIDGEVIEW SQUARE, PHILADELPHIA 19, PA.

Representatives in principal foreign countries



# FINANCIAL



## Survey Bullish on Air Earnings

- At least 10,000 military aircraft will be produced annually in the mid-Fifties, Value Line study says.
- End of excess profits tax in 1953 will help assure good profits; increase in airline traffic also seen.

The future looks good for aviation groups, according to the August issue of "Value Line," an investment advisory service. The current issue also includes a review of profits projections of the aircraft and airline industries, and general industry comments. Specific projections are shown on the individual companies analyzed by the service.

Long-term prospects are considered bright for the aircraft group. Sustained production schedules are expected to be maintained through the end of 1953, the period target date for 145 groups in the Air Force and 16 other groups in the Navy. Value Line estimates that will result in a complement of about 38,000 military planes.

An estimated attrition rate of "perhaps 25% a year" is applied to a conservative buildup, resulting in the production of a maximum of 10,000 planes annually with a 20% obsolescence rate. (This would compare with only 9,000 planes estimated for 1950.) This projected production for the second half of this decade is cited as equivalent estimate of sustained

activity for the aircraft business.

**Rise in Earnings Seen**—The investment service presents a number of pertinent observations on future profit margins. It says:

"Under existing statute, companies are allowed to carry up to 10% profits on military projects. This results in only a 10% return on sales in net income after allowance for the customary 70% profit tax to which most aircraft manufacturers will be subject this year."

"Nevertheless, the industry is to reap full earnings as rising to its increasing air traffic despite minor profit margin and government tax liability. If the excess profit tax is allowed to lapse in mid-1953, as provided in present statute, and if there is no offsetting increase in the severity of price reduction, a marked improvement in earnings is likely to be reported by the aircraft companies over the next 3 to 5 years."

As preface to its individual aircraft comments, Value Line declares:

"In general, we envision earnings for the aircraft firms at about double those

estimated for the current year. Double payments may show in even wider measure. The market's capitalization of the earnings and dividends of aircraft manufacturing firms is likely to remain conservative because this is basically a cyclical industry, heavily dependent upon government business which has fluctuated enormously in the past."

"We do not expect these stocks to sell for any long period at the prices as low as a 7.5% dividend yield basis."

**One by One**—The advisory service's view on the future sales earnings and dividends for the separate aircraft companies reviewed may be summarized as follows:

• **Boeing**—"We forecast average annual sales of \$575 million in the mid-Fifties. If the excess profit tax is allowed, as we believe likely, earnings are expected to average \$10.35 a share and dividends \$5 a share in the period 1954-1956."

• **Grumman**—"Here allowing for the 'stretchout' of military aircraft output, our forecast of first sales volume will amount to perhaps \$475 million by the mid-Fifties. On the conservative assumption that about 45% of this sales volume will carry through to net income, our forecast of average earnings of \$2.55 a share in the years 1954-56. Dividends are placed at \$1.35 a share."

• **Lockheed**—"Our forecast for the mid-Fifties is average annual sales of \$550 million. Earnings for the years 1954-56 are estimated at \$37.90 a share and dividends at \$9.00 a share, on average, our assumption being that about 45% of sales will be brought through to net income once the excess profit tax is lifted. Another 45% might be voted as the forward level of profits is attained. . . ."

"Douglas is considering the production of a jet transport. Financing arrangements have not yet been worked out. The prospect of such a development program is a serious matter, for without loan orders as based on promise of government support, development of a prototype commercial jet plane would require considerable financial risk for the company."

• **General Dynamics**—"We forecast average annual sales for General Dynamics of \$325 million in the period 1954-56. Once the excess profit tax is lifted, a considerable portion of profit should be brought through to net income (General Dynamics now pays the maximum 70% rate). Our long-range forecast is average earnings of \$8 a share. In view of the company's strong financial position and its liberal dividend policy in recent years, dividends may average \$4.90 a share in the mid-Fifties."

• **Northrop**—"We look for sales volume to average about \$400 million (after allowance for the excess profit tax) in the period (production scheduled) in the period

**HOT AIR For a HOT BOMBER**

**from JOY AXIVANE AIRCRAFT FANS**

The Boeing B-47 travels at altitudes where the temperature is somewhat less than boiling. Since the cabin is pressurized, the pilot wears no mask. Unless prevented, the moisture in his breath would quickly condense and freeze on the plexiglass windshield and creep leaving him with no vision at all.

Boeing engineers handled a Joy AXIVANE aircraft fan, with integral heating unit, behind the instrument panel. Hot, dry air, blown through a V-duct to both sides of the windshield, prevents frost from accumulating. It also eliminates the freezing of windshield fog upon rapid descent into warm air.

This AXIVANE fan, standard on all B-47 bombers, is only 35" in diameter and 6 1/2" long, and weighs a scant 5 pounds, yet it produces 40 CFM at 57" W.G. Housed among its 1540 vane air flow meter, the bearing clearance is thermodynamically precision. A & N design specifications throughout.

Joy designs and builds each fan to the exact requirements for which it is needed. Each fan, therefore, is custom-engineered for highest efficiency. For many aircraft such fans can be supplied from the inventory already designed. Each single and two stage unit available. Optional features include: variable speed motor, heated or cooled connections, rubber hose flanges, modification, and modified versions where required.

Here are some of the many uses for Joy AXIVANE Aircraft Fans: Windshield de-icing, windshield or wing de-icing, cabin heating, cabin ventilating, cockpit heating, cooling radio and electronic equipment, cooling voltage regulators, oil cooling, gear-box cooling, instrument cooling, air re-circulation, and high-altitude pressurized heating.

Write for Bulletin, or  
*Consult a Joy Engineer*  
 Over 100 Years  
 of Engineering Leadership

**JOY MANUFACTURING COMPANY**  
 GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.  
 IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, SALT, ONTARIO

In the Wright J-65, too...



Resistoflex hose assemblies save space... resist fatigue... deliver full flow



with  
**Forged  
Aluminum  
Fittings**

Resistoflex hose assemblies with forged aluminum fittings contribute substantial advantages to the "peppy" design of the Wright J-65.

Resistoflex retort and surge elbows, for instance, take up less space and eliminate need for adapters. Machined from forgings, they offer more resistance to fatigue and therefore to leakage. True internal bends and smooth interior finish afford full flow.

Specifications and helpful data are given in the Resistoflex Airmat Catalog. Don't fail to get your copy—write us.

Super Divisions! Plus, use in our Resistoflex fittings that carry U.S.A.F. and "NAC" approval.

**RESISTOFLEX**

CORPORATION

Belleville 6, New Jersey

Model 1500000 or 1500000 with optional gasket! Also get catalog for full-size "RESISTOFLEX" products.

1954-56. On the assumption that the excess profits tax will be removed and that net income will approximate 45% of sales, earnings are forecast at \$4.70 a share and dividends at \$4.25 a share for the next 5 years.

•Martin: "For the long pull (the period 1954-56) our forecast is average sales of \$200 million, earnings of \$5.90 a share and no dividends. As a result of the large losses sustained in recent years under its commercial aircraft program, the company enjoys an accumulated carry-forward tax credit of about \$40 million (or roughly \$2.0 a share).

•North American: "Our forecast for the years 1954-56 is average sales of \$435 million. Assuming that about 45% of such a volume would be taxable through to net income after the excess profits tax is lifted, we forecast average earnings at \$5.00 a share and dividends at \$2.75 a share.

•Republic: "For the long pull (the period 1954-56) Republic should enjoy a large volume of business under the military aircraft procurement program which is scheduled to peak in late 1953 and continue at a high rate through 1954 and into 1955. Our tentative forecast for this period is average sales of \$275 million and earnings of \$4.50 a share. The dividend forecast is \$2.50 a share.

•United Aircraft: "We forecast average sales for United Aircraft in the years 1954-56 of \$650 million. Earnings are estimated at \$7.90 a share during this period upon the assumption that about 45% of sales will carry through to net income, since the excess profits tax has been lifted. Dividends are forecast at \$5.50 a share."

►Continues on Carman—A more cautious, albeit optimistic, view is advanced for the air transport group by Nucleon Ltd. The long-term prognosis for this industry is somewhat up, as follows:

"With volume and capacity expected to expand at modest levels, earnings will also register improvement. But the growth in earnings will not be as令人惊奇 as that which would normally be expected in such a highly leveraged business.

In the first place, the extension of low-fare coach service will weaken unit structures and serve to narrow operating margins. In addition, higher interest and depreciation charges in connection with the expansion of facilities will drain off a large portion of the increase in revenues. Nevertheless, on higher volume, moderate gains in earnings are indicated."

►Individual Airlines—As with the aircraft group, the individual industry survey also presents the long-range forecasts for the individual airlines included in its review.

•American: "With a high level of

# COMFORT

on the line!



**NEW** mobile aircraft air conditioner by Airtemp brings complete all-weather comfort to airliners with *South Wind* heaters

Complete on-the-ground, all-weather comfort for airline passengers is achieved by this new mobile air conditioner by the Airtemp Construction Corporation.

Airtemp chose Stewart-Warner South Wind Heaters, acknowledged leaders in the field of aircraft heating, for dependable cold weather operation. The heater supplies up to 200,000 BTU's—more than ample, even for arctic opera-

tion—direct to the plane's own ventilation system. Stewart-Warner supplies the electric fuel pumps and instruments, as well.

Already chosen by Chicago and Southern Air Lines, United Air Lines and Capital Airlines, the unit is finding ready acceptance by the industry for its dependability and ease of operation. Another example of South Wind leadership.



Left hand panel of truck with engine dies open for inspection in service. Right is direct to compressor. The instrument panel on the right controls Stewart-Warner liquid level and temperature gauges.

**South Wind**

AIRCRAFT HEATING

ONE THERMAL  
ANTI-ICE EQUIPMENT  
INERT GAS GENERATOR

Seize maximum efficiency. Only the deeper control of the heater is visible. The South Wind heater itself is so compact that it fits completely inside the truck, yet supplies up to 200,000 BTU's of heat in cold and arctic



## ONE-MAN OPERATION

**TEX-MET**

new, lightweight

## CARGO-CART

Here's the ideal transport cart for small-plant operations and home use. Lots of storage space... lots of use... no maintenance... but little weight! Aluminum channel frame with rubber flooring and strong bearings. Tex-Met's Cargo Cart may be the most use-to-operate, strong and sturdy cart in its class... low maintenance... but high in service and economy.

### Tex-Met's Cargo-Cart

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

Meets up to 1,000 pounds of storage.

household and personal activity expected to be superimposed on the strong secular growth trend in airline traffic, so domestic average gross revenues of \$12.8 billion in the year 1954-55. Higher depreciation charges and a one-third decrease in passenger en route charges, however, will prevent earnings from growing as rapidly as might be expected in such a highly leveraged business.

In view of the probability of the eventual obsolescence of present flight equipment through perfection of jet transports and the tendency for the purchase price of new airplanes to rise more considerably, dividends will probably remain constant or drop slightly in the mid-Fifties. For the year 1954-55, we average average earnings and dividends of \$2.18 and \$1.75 a share, respectively.

**Electric.** On the basis of the increased capacity provided by the new plants and the expected contribution of the secular growth trend in traffic, we estimate average gross revenues of \$10.9 billion a year in the mid-Fifties. Earnings, bolstered by the impact of the Power Profits Tax law, are expected to average \$4.50 a share, domestic substantially higher depreciation charges. In view of the extreme financial conservatism of the management, no radical change in the dividend rate is forecast. We expect dividends to be a case no more than \$1.75 a share in the 1954-55 period.

"Electric and Gaslight & Power have acquired Electric's offer to purchase Coleridge's stock. Although CAR has other plans for acquiring Coleridge, there is a good chance that this may eventually be their approach. Disposition of the two lines would add considerably to Electric's total earnings power and result in an annual reduction of one low-price security category."

**Northern.** "Presumably the addition of new, more efficient airplanes in 1954 or early 1955, we estimate average gross revenues of \$7.2 billion in the 1954-55 period. Earnings, however, are not expected to register a sizable improvement."

"Interest and depreciation charges will increase because of the availability of more costly equipment and the increased extension of such service over Northern's low-density routes will adversely affect operating margins. That doesn't mean, however, that the greater efficiency to be derived from the utilization of improved equipment remains as expected to average no more than \$1.95 a share in the year 1954-55."

"In view of the strained financial position and the large capital outlays that appear to be necessary, consumption of dividends is possible more than five years away."

**Pen American.** "The year 1954-55, we forecast average gross revenues of \$275 million and average earnings and dividends of \$5.60 and \$3.75 a share, respectively."

**TWA.** "For the year 1954-55, we forecast average gross revenues of \$195 million, average earnings of \$5.55 and average dividends of \$4.50."

**United.** "Earnings growth will be concentrated by the expected conversion of the convertible preferred and the consequent dilution of per share earnings. For the year 1954-55, we forecast average gross revenues of \$180 million and average earnings of \$1.50 a share and average dividends of \$1.10." (These figures are based on the share of Value Line advance service and not necessarily those of this writer. Neither the writer nor American World, you see, or neither the service.)

—Selig Altschul

## WHAT'S NEW

### New Literature

Proper dissemination of engineering drawings is an ability acquired by experience, but a possible shortcut to experience is better afforded by the Gabelt Machine Co. E. C. Holske of Gabelt, Inc. prepared a booklet, *Practical Dimensioning*, which should be a definite guide to the student engineer, and a quick source for those who are offering in the business. Gabelt is offering a sample copy of the booklet free to anyone writing in on a company letterhead. Price, as quantity is 30¢ per copy for two to 49 copies, 50¢ or more cost 20¢ each. Gabelt Machine Co., 1215 E. Washington Ave., Madison 18, Wis. —DAA

### New Publications

Newly developed techniques for using small, low-temperature electrolytic capacitors for fast metal foil, are described in a recent general report, PS 105-630, entitled "Fast Report, Investigation and Research Pertaining to the Development and Design of Electrolytic Capacitors for Low Temperature Operation." It will be \$1.00 in manuscript, \$1.75 in printed form, obtainable from the Texas of Congress, Photocopying Service, Publication Board Project, Washington 25 D.C.

### Publications Received

"Steel Sheet, Fabric Forming, Facilities for Submerged Trench, 1950, published in *Urethane*. A guide to the high line and facilities pertaining to the movement of persons from one country to another."



## Townsend Builds New Cherry Rivet Plant for Better Service to You

Faster delivery on Cherry Rivet and other Townsend products is now possible with the recent completion of a new half-million dollar plant at Santa Ana, California. The spacious, modern layout is designed to streamline production and provide for more efficient operation than was possible in the crowded Los Angeles location.

Increased demand by the U. S. Air Force and Navy for Cherry Rivet Rivets to supply the aircraft expansion program made it necessary for Townsend to expand its facilities for

this vital product which is virtually indispensable to aircraft construction. Their use makes possible refinements of design and assembly methods of control surfaces and other components that speed fabrication with big savings in unit costs. Cherry Rivets are installed by one man from one side of the work with a pulling action—without bucking, hammering or exploding.

The construction of this new Santa Ana plant is typical of Townsend's policy of constantly improving its manufacturing facilities—at Chicago,

Indianapolis, Plymouth, Michigan and New England, Pennsylvania. At these plants, new and faster equipment for manufacturing of the 10,000 sizes and types of special and standard and cold-headed fasteners produced by Townsend is being installed regularly as a part of its expansion and modernization plan.

This program makes it possible for Townsend to continue to supply all industry with high-quality products at reasonable cost—and help speed production of defense and civilian items alike.

# Townsend

COMPANY • ESTABLISHED 1916

NEW DIVISION: TOWNSEND

Santa Ana Office in Progress Only

Cherry Rivet Company, Townsend, Inc., Chicago, Ill.

**THE PATENTING AUTHORITY—Experiences—The price—Quality—only million parts daily—Products over the broadest types of steel rivets—cold headed parts—Cherry Rivet Rivets—Special Rivets and Tapping screws—Rubber rivets—special rods—Internal wire parts—Plants: New England, Pennsylvania—Chicago, Illinois—Plymouth, Michigan—Santa Ana, California.**

**TEXAS METAL & MFG. CO., INC.**

1114 Fourth Park Road • Dallas, Texas

1000 E. 10th • New York 10 • Full Tex-Met

all types of sheet metal and machinery

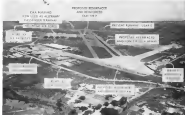
Specialized for the Airline Industry

Specialized for the Airline Industry

## EQUIPMENT



PAL DC-6B 51417PR, Manila, is one of four in the carrier's fleet



MANILA INTERNATIONAL AIRPORT is PAL's operations and overhaul by

## Philippine: Carrier That Returned

PAL maintenance practices, rising business help push profits up; new DC-6Bs, 340s potent expansion.

By George L. Christian

Manila-Philippine Air Lines has shaped a really great comeback.

When the japs bombed the Philip years in 1941, PAL—not yet a year old—had extended its service throughout the islands. The war put a stop to that, and the carrier moved—base, planes, and baggage—down to Australia for the duration. With the end of the war, the carrier returned, and with newly native talent, on machinery much of which was salvaged or engineered, and in battle-damaged, hard-scrambled buildings, PAL has since achieved an impressive maintenance and operations record.

Now the airline looks forward to

making a revival of President Andrew Bonifacio's "Operation Dismal"—a one-man war against the world system. Looking most long at Spanish-speaking peoples. Delivery of two new Douglas DC-6Bs in July and expected delivery of six C-47s in 1948 will give the carrier a new lease on life, and the carrier's financial health will be a factor in the decision.

Good Year—PAL's particular relief and expansion, special largely by T.O. Bellini, vice president, has been aided by many noteworthy achievements, the carrier's officials feel. This record list was chosen:

• Lowest unscheduled engine overhaul rate of an R2500 operator. During the twelve months ended June 30, 1951, PAL received only two engine for failure, according to Pratt &

Whitney. No other R2500 operator could equal this record on a composite engine overhaul basis, says PAL. And PAL, with its unscheduled R2500 cylinder overhaul at water turbine stations at a low rate in two years.

• First DC-6 operator to have its major overhaul period listed from 8,000 to 12,000 hr. Success was based on excellent condition of PAL's first DC-6 to undergo its 8,000 hr. major and was approved by the Philippine CAA and Douglas Aircraft Co.

• Highest net profit to assets \$3,450,000 in 1951, an increase of 107.5% over 1948. Eliminating profits from equipment sales, net was about \$1,150,000, a rise of 250%.

• Highest total payload from 73,175 to 51,715.

• Increased cargo ton-miles to 1,390,000, a 45% one-year jump.

• Highest 24-hr. utilization per day out of its DC-6s. During this report's visit, only three DC-6s were in service, the fourth being in for a major, but these weekly profits were from two roundtrips, Manila-San Francisco 15,575 mi., one roundtrip, Manila-London 17,166 statute mi., one roundtrip, Manila-Tokyo 3,755 statute mi., two round trips, Manila-Hong Kong 5,335 statute mi., total, 57,898 statute mi.

• PAL's scheduled operation has grown healthy again. Overhead load factor moved up from 65% to 77%. Passenger revenues climbed 36.5%, and revenue passengers 21.5%. International will get a shot in the arm when the six C-47s 340s scheduled for delivery early next year come in. They will also permit scheduled service in the Orient. The two DC-6Bs the carrier got in July now provide main flights to Europe.

• On the Base-Philippine Air Lines does many jobs at its large base here. It is completely self-sufficient on DC-6 overhaul, and does its own work on its fleet of four Nordbergs Norsemen.

• In shops have taken over the R2500 overhaul previously done by KLM at Schiphol Airport in Holland. The reports about one third of PAL's R2500 overhaul, the balance is done by United Air Lines in San Francisco.

• It performs most DC-6 overhaul here, with the exception of major structure (AIA, does this) and specialized equipment.

• Inspections 1 (99-90 hr.) through 6 (4,000 hr.) use a Manila function.

• Complete DIRs (Disposit Inspection and Report) are being performed here as two C-47s, under USAF contract.

Negatives are on for additional aircraft Philippine overhaul, says Bellini, is the only commercial shop in the region with complete C-47 overhaul facilities, including engine. This



**American Electric**  
Variable Frequency  
**MOTOR-BLOWERS**



**TWO POWER TYPES**  
Single or double ended

Especially designed for spot cooling electronic equipment, blower circulates air. Unique design insures maximum weight loss over full frequency range of 210 to 1000 cycles.

In spite of wide frequency variations, the often caused resonance is completely eliminated at the level. As pressure is reduced, the fan increases, providing additional efficiency of cooling air.

**AIR DELIVERY** Blower heads available for any direction of air delivery.

Write for literature



New alloys can present complex welding problems. These are the problems aircraft engineers usually turn over to us. "That's a job for Lavelle", they say. And they're right! Lavelle's technicians have the experience and the equipment to do the job. "Shop Control", the precise care they exercise in every phase of their work, has brought us an industry-wide reputation as a truly unique and reliable subcontractor.

**Lavelle**  
AIRCRAFT CORPORATION • NEWTOWN, BUCKS COUNTY, PA.



## TESTING TOPICS



**GREER OIL BADALUZ TEMPERATURE CONTROL VALVE STAND** is shown here detailing operation of the automatic control and range adjust valve used with air craft oil radiators under low, normal and high temperatures. At right is the Greer Vacuum Pump Tester for testing complete performance of vacuum pumps.



**GREER PORTABLE HYDRAULIC TEST MACHINES**, shown in operation, above, provides hydraulic test fluid under 3000 psi pressure and at flow rates up to 20 gpm for checking hydraulic system of modern aircraft in the flight line.

## Greer helps TWA keep 'em flying

Airlines, like manufacturers, count on the accuracy and dependability of Greer equipment for important testing operations.

Greer Hydraulics, widely known for accuracy and dependability, has led the movement toward standardization of test equipment. Today, only in unusual applications must machines be designed to order. In most cases, equipment may be selected right out of the Greer catalog (write on letterhead for your free copy).

But standardization is not all the job. Keeping up is not enough. Greer equipment must stay ahead. Growing complexities of aircraft systems make ever greater demands on test equipment.

**Greer Hydraulics Inc., 454 Eighteenth St., Brooklyn 15, N. Y.**  
Field Offices: 111 Commercial Bldg., Dayton • 804 E. Grand Bldg., Detroit • Representatives in all principal cities.



**HEARD cylinder under pressure** on constant time heating tests on R-2800s.

could USAP to test, considerably less and saving in avoiding long, time-consuming ferry flights to Bermuda for DTR. And the planes can be returned to duty in Korea and Japan in much shorter time.

The new USAP (C-47) DTR'd by PAL at the Miami ship received its first overhaul since 1944, and 100% of plumbing and wiring had to be replaced.

• **Northwest Airlines** DC-6's come into PAL's railway on check docks for inspection and turn-around maintenance.

• **PAL** performs heavy maintenance on Philippine Air Force C-47's and overhauls many F4F fighters.

Other aircraft serviced by PAL at Miami are: KLM Constellation, Canada Constellation, Pan American DC-6, Civil Air Transport C-46, and SAS DC-6's when diverted to Miami. Greer's work such as annual inspection and maintenance is also performed on executive airplanes, DC-3's, etc.

• **Proposed** Engstrom-Philippine Air Lines, with its long, over-water and long-haul routes, is understandably fussy about the care given its DC-6 propellers. Its engineers use these reasons for the unusually low cylinder pressure, rate and top-of-the-pipe, uncracked, engine failure rate.

• **Core discipline:** When the airline first started service, engine failures were numerous—ones were pulling too much power to keep on schedule, according to PAL. Schedules were not met in approximate speeds obtained at more conservative power settings. (Average time lost was 17 min. on a 910 mi hop.) Cores were inspected to adjust rigids, to the operating temperatures set up by the airline, and failures took a nose dive.

• **Compression checks:** PAL's maintenance crew pull compression checks on the engines at every 1, 2 and 3 major stop, an average of one every 39-52 mi.

# JET ENGINEERING

## ... a challenging opportunity

Jet Engineering means more than a profession — it means pioneering a new industry.

Only 10 years ago, General Electric produced the first American jet engine. Since then, jet power has revolutionized aviation, and G-E has become one of the largest jet engine builders in the world.

The future of the jet engine is practically limitless. For example, the market for jet transport aircraft has only been scratched. Today, the world's commercial airlines are preparing for the new era of jet power air travel.

General Electric's Aircraft Gas Turbine Division offers an engineer unusual opportunity to shoulder responsibility. Here, an engineer's progress is limited only by his own ability.

This is your opportunity for a permanent career in a progressive new industry. We invite you to match your qualifications with the challenging assignments listed below.

### POSITIONS AVAILABLE IN JET ENGINEERING

DESIGN WORK DESIGN	TESTING	FIELD MAINTENANCE
DESIGN ANALYSIS	TEST ENGINEER	FIELD ENGINEER
WEARABLE AND SUBSYSTEMS	TEST ENGINEER	FIELD ENGINEER
ADDITIONAL WORK	DESIGN AND	FIELD ENGINEER
FIELD MAINTENANCE	DESIGN AND	FIELD ENGINEER

Positions are available at West Lynn, Mass., and Lockland, Ohio. Do not apply if your best skills are being used for vital defense work. Please send resume to Technical and Supervisory Personnel, Aircraft Gas Turbine Division, Dept. A.



This modern engineering and administrative building is the hub of all activities at G-E jet center.



Boeing B-29, shown in flight, is the world's largest bomber. It is the fastest jet bomber in the world.



Delivery of G-E J-47, West's new production jet engine, is the fastest jet engine in the world.



G-E engineers conduct tests on new turbines in our test cell. Performance record G-E jet engine is the best in the world.



G-E engineers conduct tests on new turbines in our test cell. Performance record G-E jet engine is the best in the world.



to catch misport cylinder malfunctions, before they become serious fire hazards.

◆ **Engine Overhaul Shop.** Complete overhauls, and subsequent engine overhaul facilities and personnel can handle in no small measure to the engine shop, PAL says. And UAL, which does not have a DC-82000 engine, has done a superb job. Walter L. Hurd, Jr., general operations manager, told American Week. The tool used is doing a fine job, no influence as well as an engine. He and PAL would be hard pressed to operate its over-1000 miles with only four or six over-1000 miles. The machine can

United is planning for the nation and of PAL's new Philippine looks for an even better engine. It will show its heavy work on the DC-82000 and is already in operation. ◆ **Powerplant Overhaul.** PAL's engine overhaul shop contains much of the modern machinery required to turn out a first-class overhauled engine. But here and there are ingenious adaptations and improvisations born of necessity. ◆ **A Bitch No. 71** cylinder glands has been adapted to grind out the center main bearing bore on DC-82000 engines. And an adaptor plate, to fit cylinders in the works. The machine can

quickly be converted to a cylinder grinder.

◆ **Is the carburetor shop a house-made but effective "variable mixture" works** diaphragm and valves work from 8 in. to 1 in. Diaphragm work made in the shop, covered C-47, do as the best pump. Fuel flows through carburetor valve from the diaphragm at being covered. Poppet valve is moved through full range about six times a second.

◆ **Two 1/2 in. bolts welded together** provide an inexpensive, can be used for rig to check out DC-82000 engine emergency relief valve.

◆ **Submerged hot** boiler pump are tested on a locally made tank.

◆ **Half Standard**—Another idea of PAL's is to cut standard PLWA engine parts from in half, accepting parts from near section, power section and not section. This supplies inspection and accessibility.

Vapor blasting parts such as valves and valve springs is giving excellent results. PAL spokesman says. Shell blasting also is doing a good job. But they are trying to find someone in the Philippines to grind up coconut shell locally to avoid having to import shell from the U.S.

Both ends of all second-hand tank plugs are dipped in "Seal Per" plastic preservative to protect them from corrosion or weather effects. Advantage of Seal Per is that it is quickly and easily removed, creates a hermetic seal and does not get between electrodes and lead them.

When completed engine change from the heating shop, they are taken to modern test cells capable of accommodating up to four powerplants. Cells were built to make R1140s, R1150s, R2000s and R2100s.

◆ **Reconstruction & Repair.** A section of PAL's shop is Reconstruction and Repair. It might not be necessary in the U.S. because of high labor cost but pays PAL big dividends. Some parts come high in price, and are often hard to get. Labor is expensive. So, many parts that normally would be replaced are repaired and put back into stock, cut a considerable work is required to restore them to serviceable condition. Maximum stock level for Materiel parts is a low level.

◆ **Answer the Shop.** One trick used by PAL, short-handed men when replacing parts of this is to use the removed piece as a template for drilling the new sheet. This cuts wrinkling and bubbling due to poor alignment to a minimum.

An accidental explosion prompted the idea to build a test tank out of 1-in. boiler plate. Operation is worked in a test.

◆ **DC-4 (Deputy)** of PAL's inter-city flights are operated with DC-7s, except

for a few flown in Nauru. Since the airline does not have any night flying yet, the large open area is to fill with DC-7s every afternoon about 100 flights.

◆ **They are then looking** shops made and use. Some of them listed:

◆ **Tops are pointed** walls to reduce heat.

◆ **Fancy chairs** sport marsh on the forward bulkhead, hand painted by master of Master Brown.

◆ **Bottom of bulkhead** in cabin is slanted forward to provide foot room for passengers in front row of seats.

◆ **Seating arrangement** for 20 passengers includes eight rows of three seats plus a double two-seat seat at the rear of the cabin, facing the entrance door.

◆ **Next to entrance** baggage racks brighten up the plane's interior. They also wipe clean only saving much maintenance time.

◆ **Good days are fixed** to approximately the fuel position to avoid maintenance on hydraulic controls and associated leakage. Pilots are well pleased with the setup except that cylinder head temperature tend to go too low when flying through heavy rain experienced in the inter-island operation. Ketchikan, Alaska is the main stop.

◆ **Emergency door** hinges are being moved from top to forward side of the oval. Purpose is to keep door from being passengers on board and back should they have to land out. PAL is also contemplating getting Colonial Airlines' exterior handle on its own gear cars, thanks to a good idea and simple and cheap to install.

◆ **Sealed** instrument panel covers in the power lines. Tight instrument covers are in front of pilot and co-pilot are standard in arrangement, and "airline service" of each other.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.

◆ **Flaps** when pilot and co-pilot are positioned at approximately level the same relative position. Arranged with no need to use weight and maintenance. Flaps are to start pilots but it was not needed. All engine instruments have been grouped in the center of the instrument panel usually visible to both pilots. Tailwheel is directly in front of propeller controls, and main fuel pressure set in front of throttle. All instruments are in front of throttle.



## SEWING HOT SEAMS THAT ADD MILES

... by PASTUSHIN

Modern, precision methods used by Pastushin-Aviation to produce aircraft components make possible lighter, stronger jet-powered fuel tanks to increase range and combat effectiveness of American's fighting aircraft.

AMERICAN FUEL TANKS • SEALS • LANDING FLAPS  
AIRBORNE • TAIL SURFACES • JUMP BAY DOORS

**PASTUSHIN AVIATION CORPORATION**  
2450 West Century Boulevard • Los Angeles 48, California

LOS ANGELES INTERNATIONAL AIRPORT, LOS ANGELES, CALIFORNIA



# NORTH AMERICAN

Uses

## MELETRON

Pressure Actuated  
**SWITCHES**

Wherever a system calls for control, actuated by pressure changes, there is a MELETRON product to handle the job.

Used on the North American F-86

Meletron pressure switches are known by the engineers they serve

**MELETRON CORPORATION**  
600 NORTH HIGHLAND AVENUE, LOS ANGELES 26, CALIFORNIA

J. M. WALKER CO., 2000 First Street, South, THOMSON LIGHTING SERVICE, 208  
Hempstead St., New York and 210 E. Broadway, Mobile, BUCKLEY CONTROLS LTD.,  
Montreal, Quebec, Canada, W. M. HICKS, 25 27 Bridge Street North, Long Island  
City, New York



## the new sub-miniature

### CANNON PLUGS

### tiny but rugged

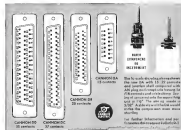
Since 3-D Series Plugs enjoy a long life span of the electronic industry in a small, versatile and ruggedly constructed design, they are an investment in equipment of all kinds. These may be mounted on (1) rock and panel (2) box (3) wall, or (4) end connector. Junction shells with integral design protect the internal cavity of the connector when used as end or wall mounted unit.

Contacts are of the quality you expect to find in any Cannon Plug. Mechanical loads up to 100 lbs. are withstood. They come in 100's or 1000's and are available in lead, gold, silver, and tin.

Capable of 500,000 cycles, Cannon Plugs are rugged, reliable, and long-lasting. They are available in 100's or 1000's and are available in lead, gold, silver, and tin.



Cannon 3A Plug and Cannon 3B Plug with lead in shell



## CANNON ELECTRIC

SINCE 1914, Cannon Electric has been a leader in the electronic industry. Our products are available in 100's or 1000's and are available in lead, gold, silver, and tin.



- EXPERIENCED FLIGHT TEST INSTRUMENTATION ENGINEERS
- FLIGHT TEST ENGINEERS
- FLIGHT TEST ANALYSTS

- Dealing with
- GUIDED MISSILES
- AIRPLANE SYSTEMS
- AUTOPILOTS

The Missile and Control Equipment Laboratory of North American Aviation has openings in its flight test organization to handle flight testing of guided missiles and electronic control systems.

Excellent opportunities are offered for experienced engineers and analysts with airplane and guided missile flight test and flight test instrumentation background. Outstanding opportunities are available on a long-range development program on basic guided missile work.

- SALARIES COMMENSURATE WITH TRAINING AND EXPERIENCE
- EXCELLENT WORKING CONDITIONS
- FINEST FACILITIES AND EQUIPMENT

Write now. Give complete resume of education, background and experience.

**NORTH AMERICAN  
AVIATION, INC.**  
Engineering Personnel Department  
Missile and Control Equipment  
Laboratory

12214 LAKEWOOD BLVD.  
DOWNEY, CALIFORNIA



DUAL ENGINE INSTRUMENTS on PAL DC-3 panel help simplify the display.

moving and operating all these instruments. PAL's new system has its own and had to supply precision and generator about as difficult as there, where there was no mechanical power source.

The system also operates its own air traffic control system and handles several of its own minor systems.

Strong on Training—What Would Was II equipped the Philippines, now the PAL, closed down in the islands. So, when Philippine Airlines came back into operation in 1946, many men who were promoted from the four to supervisory positions had no supervisory experience. The situation was made more acute by the rapid expansion of the airline.

A Mr. Phillips, who came to the islands in an instrument technician, because interested in the problem and requested what turned out to be the first management training program to meet its own industry in the Philippines, according to PAL. It follows the basic Air Service Command course and during the last year.

Other plans put into effect are a "job improvement program" cooperative to U. S. employee suggestion plans, and on-the-job training coupled with technical class room instruction.

The airline received \$1,250 in the job improvement plan, and in its first six months paid \$15,300, PAL says. The Philippine economic has fully justified the increasing responsibility afforded him, having experienced unusually high this year.

Personnel of the engine overhaul shop, for instance, gave him a new

put on the back for their quick completion of the job at hand, usually directly in handling precision parts and study closely with which they did each job exactly according to the book. Their patience fits them for the co-acting, repetitive jobs always found in an aviation plant.

Complete Casualty—Latest addition to PAL's headquarters here is a new and open community. Tony Selig, supervisor of passenger service, proudly points out the unit is operated by the former chief of Roper's Changing Airport. Working funds, wages and salaries from all over the world, the plant is responsible for preparing all food served aboard PAL's flights out of Manila. It incorporates an aptitude kitchen and refrigeration plant, three dining and a drink, even for local personnel.

Airport Problem—PAL faces a problem when it gets its feet of Colonel W. H. Meacham is the only station in the islands with the traffic potential to justify the Convair that also has an airport capable of handling the aircraft, according to PAL officials. At least eight other airports have traffic, but the airport is not large enough for the plane, but the airport is not large enough for the plane, but the airport is not large enough for the plane.

One of the main reasons has been appointed by the Philippine government for the local CAA to use as airport improvement.

"Operation Doctor"—Colonel B. L. Anderson, PAL's vice president told American Wire of his company's plan. Addition of the two DC-6s to PAL's international fleet has permitted these increases in flight schedules.

One of the main reasons has been appointed by the Philippine government for the local CAA to use as airport improvement.



Finally, working at North American requires hard thinking and plenty of vision. Because North American always works on the future. Yet, if you are interested in advanced thinking, if you'd like to work on the planes that will make tomorrow's aviation history, you'll find working at North American. Write to American—offer these and be heard, too.

### North American Engineers—

- Selective commensurate with ability and experience
- Paid vacation
- A growing organization
- Complete employee service program
- Civil Air Service
- Sea port facilities
- Financial opportunities for advancement
- Group insurance including family plan
- Sick leave and more
- Transportation and moving allowances
- Employee Credit Union
- Educational school program
- Low-cost group health (including dental) and accident and life insurance
- A company 24 years young.

### Write Today.

Please write for complete information on every opportunity at North American. Include a summary of your education, background and experience.

### CHOOSE THESE OPPORTUNITIES At North American

- In aeronautics
- Stress Engineers
- Aircraft Design and Production
- Specialists in all fields of aircraft engineering
- Aircraft engineering graduates
- Engineers with ability adaptable to aircraft engineering

### NORTH AMERICAN AVIATION, INC.

Dept. 18, Engineering Personnel Office  
Los Angeles International Airport  
Los Angeles 40, Calif., California 90045  
North American has both day and night  
from any other company in the world

# AVICA

LIGHTWEIGHT

**STAINLESS STEEL HOSE ASSEMBLIES**  
for  
**Experimental and Production**  
**JET ENGINES and AIRCRAFT**



AVICA Stainless Steel Hose Assemblies maintain their flexibility and reliability at very low temperatures — for example with liquid oxygen at minus 360°F to plus 1250°F — for afterburner and rocket applications.

AVICA mechanically applied detachable end Couplings can be made in Stainless Steel, Mild Steel, Corrosion Resistant, Aluminum Anodized or Titanium according to application. AVICA can supply hose assemblies with elbows to customer design, bend radii 3" to 18" in. Size range from 1/2" LD to 4 inches ID. Consult our Engineering Department for AIN Standards or Special Fabrications.

For complete information write to Dept. AM

**AVICA CORPORATION**  
PORTSMOUTH, NEWPORT, RHODE ISLAND



## DYKEM STEEL BLUE STOPS LOSSES

### making dies and templates

Blueing leads us right to the heart, ready for the layout in a few minutes. The dark blue background makes the colored layout lines show up in sharp relief, and at the same time prevents metal chips. Improves efficiency and accuracy.

Write for full information

**THE DYKEM COMPANY**

3203A, North 11th St.  
St. Louis 8, Mo.



been added. The new schedule operates into five cities, new for PAL—Zanzibar and Frankfurt. Other European flight operations to Rome and Madrid.

• Added roundtrip Manila-Tokyo, serving Okinawa in both directions.

But the big play, warbirds called "Operation Dream" by PAL officials, is a one-way, round-the-world service. This would fulfill PAL President Andres Soriano's dream of linking most large areas of Spanish-speaking peoples. To implement such a plan, a three-man commission was recently appointed by President Quirino of the Philippines to negotiate a bilateral agreement with Mexico-Mexico City is one of the principal stops through which the round-the-world service would operate. Trans-Atlantic route had not been finalized at press time.

Interesting sidelight on Operation Dream is the naming of PAL's two new DC-4Bs, which will play a large part in implementing it. One is "Manila's Coin," signifying the hard place in the Philippines of Ferdinand Magellan, the world's first circumnavigator; the other is "Manila," the place where he was killed.

• Post-World-War II: Philippine Air Lines is a far cry from its predecessor, Philippine Aerial Taxi Co. (PATCO), organized in 1911. The company started passenger service between Manila and Legaspi in 1911. Service was extended to Cebu-Manila route and Cebu-Legaspi in 1914.

Philippine Air Lines was organized in February, 1941, by Soriano and PATCO's founders and leaders were purchased by PAL.

By December, 1941, service had been extended throughout the islands, only to grind to a halt when the Japanese invasion came.

All PAL pilots including the chief pilot and operations manager volunteered and were given commissions in the Armed Air Force. Soriano also entered the service.

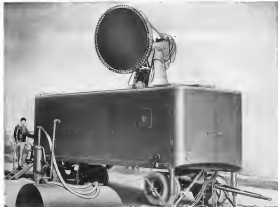
The pilot flew the aircraft to Australia, carrying mail and was presented to the new base of operations from which men and planes participated in many battles including Macassar and Java.

Commercial activities were resumed in February, 1946.

• Route Pattern—PAL's present fleet consists of 2 DC-4Bs, 4 DC-3s, 3 DC-3s and 4 Nordens Noratonic, one of which is fast-equipped.

The international route operated with DC-4s and 4Bs equips routes to Manila, Hong Kong, Cebu and Manila.

The European segment stops at Calcutta, Karachi, Tel Aviv, Rome, Madrid (to Zanzibar and Frankfurt) and London. DC-4, -4B equipment also serves Hong



## It takes PRECISION MANUFACTURING to say "HERE THEY COME"

The big, round screen on top of the mobile trailer, is a radar antenna—part of a new fire-control system for anti-aircraft gun batteries.

Details are classified for security reasons. However, many improvements and refinements, make the device more informative, effective and flexible than its predecessors.

We make the radar antenna and the intricate, precision gears that actuate the system, for the

Western Electric Company. Gears that must be precise, because gear errors of ten-thousandths of an inch, mean miles in the sky.

Ours is a record of 37 years of precision design, engineering development and production. Today, 90% of our defense work is in aircraft and ordnance contracts. We help work the miracles of exactness which strengthen the defenses and protect the security of America.



engineers and manufacturers  
Springfield, Ohio







## A "Spider" loses its skin

Here is an example of the precision techniques employed by Cleveland Pneumatic in producing landing gear for the B-36. The "spiders" are temporary bearing rings clamped on the columns. They are lashed as their outside surfaces are set to bearing points for subsequent machining operations. Following heat treating of the 13 foot columns inevitably causes some distortion. So the machined "spiders" must

be in exact alignment to the main axis of the large lugs.

Such skillful craftsmanship is one of the reasons why Cleveland Pneumatic's Aerial Landing gear is *fast in the field!* Another is the unmatched engineering knowledge gained during 36 years' experience in this essential aviation product.

The Cleveland Pneumatic Tool Company, Cleveland 5, Ohio... Established 1894.

# CLEVELAND PNEUMATIC

**First in the Field!** Aerial Landing Gear • Bulk Bearing Steels • Accessories

## LETTERS

### Aero-Sonic Propeller

We are in receipt of a letter from Wright Air Development Center, Wright-Patterson AFB, Ohio, referring to an article that appeared in your June 2 issue, entitled a "Sonic Chord" regarding the company as to the alleged advantages of the Aero-Sonic propeller.

The Wright-Air Development Center refers to their Technical Report No. 6571 (Wright Tech. No. 3357), Collection of Aero-Sonic Propellers. Mr. Edgar LeTolpue, former engineer with us, is contributing to the technical report and we request as the letters that you contact us before publishing any article on this propeller. Mr. LeTolpue is no longer in our employ.

Vernon B. Tom, General Manager  
Aero-Sonic Corp.  
42 Cambridge  
Brooklyn 4, N. Y.

### Not an Observer

The DC-7 entry slide, page 91, of your June 26 issue, contains an error obviously apparent to all flight engineers and pilots of large transport aircraft. There is no air view in the photo's composition area, as of this "slide," "observer's eye." This apparently leaves only two seats for two pilots and a flight engineer, the maximum crew on this type airplane.

The seat labeled "observer's seat" is in the small bubble of the flight engineer on the DC-7. Possibly this seat is meant for the flight engineer on the DC-7. If so, I am only hope American Wings (and Douglas Aircraft) did not automatically label it as shown. A pilot without his flight instruments requirements, but he would retain being called an "observer."

For the same reason, flight engineers standing behind long control consoles or directly adjacent to an "observer," are merely by an aviation journal which stable issue letter.

J. H. Boyer, Flight Engineer  
for Safety  
Hicksville, N. Y.

(The drawing was prepared by Douglas who was the first in the flight engineer—Ed.)

### From Follett Bradley

RE: News item from Aviation Week July 21. "Many suggestions USA leaves V. Fossati landing equipment has work was named by USAF officials' support should be added."

Crew space is a true and young need assigned to his captain and added for a leave of absence to get married. Although he had not had enough service duty to take a leave, under the circumstances the support pushed him a few days.

Some months later, the crew again added for leave, this time because his wife was going to have a baby. The captain refused, saying "I give you leave before as

I thought your present was economy of the issue of the last but I see no good reason for your present at the landing."

In the case of the Fossati, the reason is that there was no need for USAF personnel while a long overland crew being 4 sections of road one place, but where the stop is limited and very close to the number of people and children's state. I realize to predict that USAF cannot will be less.

FOLLETT BRADLEY  
Mr. Gen. USAF (Ret.)  
65 Poplar St.  
Garden City, N. Y.

[Gen. Bradley wrote the letter above only a few days before he died.—Ed.]

### Our MIT Fellowship

I would like to express my appreciation to all at Aviation Week who were responsible for the Aviation Week Fellowship.

The two additional years of education made possible for me by the Fellowship permitted me to obtain my Master's degree and complete most of the requirements for the Doctor's degree. I have recently accepted an appointment as Instructor in Aeronautical Engineering on the MIT staff, and will complete my Doctoral thesis under this assignment.

HAROLD M. VOSS  
229 Commonwealth Ave.  
Boston, Mass.

### Progress Lags

A shrewd observer in MATS for adopting standardizing using tests in their new General C-119 (Aviation Week July 21, 1954), and a kind hearted observer in the transport industry and CAA for not adopting that and many other obvious safety provisions sooner.

For example, I am surprised to see that CAA is finally hesitatingly adopting CCA as a secondary monitoring blood alcohol procedure right now after it was in use operationally in the Army and Navy. I suppose that it will take CCA another few years before it will set up long range radar stations to keep track of aircraft on the important arrival although a total of only 100-150 radar stations are necessary to adequately cover the high density areas from Boston to Washington and New York to Chicago.

Then it will probably take the industry an additional five years to install IFF equipment for dependable order identification. It seems to me that someone, somewhere along the line, isn't doing an adequate job of it. CAA is the true "bottleneck" World War II equipment and old ideas like increased flying time are too advanced for today's air transport industry and CAA. C. T. Felt  
11111 The Regency Hotel  
Schuylkill, N. Y.

to meet rigid aircraft requirements  
...check

## EMC and CYCLOHM

FRACTIONAL H.P. MOTORS

Miniature and Short General  
1/1000 to 1/10 H.P.  
Shaded Pole  
1/1000 to 1/10 H.P.  
Induction Type  
1/1000 to 1/10 H.P.



EMC and CYCLOHM fractional H.P. motors, available with or without gear sets, permit a wide range of use and versatility to meet your small motor requirements.

EMC model 120 (shown) is especially designed for aircraft applications from rated from 1/10 to 1/100 H.P.

Check the partial list of applications below, and write for our catalog and full information. Write today!

✓ CHECK EMC AND CYCLOHM FOR TWO AND SIMILAR APPLICATIONS

Autometer Systems	Crew Instruments
Black-off Motors	Wire Press
Motor Driveline	Bin Tilt
Jet engine	Barriers
Air Conditioning	Altimeters
Appliances	Barrel Rotators
Control Motors	Crew Instruments
Control Air Motors	Crew Instruments
Control Air Motors	And many more

EMC and CYCLOHM, INC.  
RAVINE, ILLINOIS  
DIVISION OF

EMC ELECTRIC MOTOR CORP.

EMC CYCLOHM MOTOR CORP.

## HOWARD



## AIR TRANSPORT

### New Performance Standards Under Study

- Government-airline group seeks accurate safety gauge for changes in airworthiness, operating regulations.
- Revised proposals, more for tomorrow's designs than today's transport types, may be ready in December.

By F. Lee Moore

Almost unnoticed in the air transport industry, a two-man working group at the Federal Aviation Administration and Civil Aeronautics Board engineers is preparing what qualified observers believe is the biggest step forward in the science of making air safety regulations.

The so-called "CAA-CAB New Performance Working Group," with co-operation of airlines and government both here and abroad is developing standards, proposals to nothing, to which new set of transport operating and type certification regulations proposed in December.

The proposed new regulations will be based on statistical assessment of risk for one flight. The engineering laws of probability applied here should give the regulations a degree of refinement and safety control revolution compared to present standards based on subjective analysis of past experience only.

• **Tireable:** The new statistical approach to safety regulation is similar to safety test data in quality control by mass manufacturing industries.

Tireable: all development of these new ideas from the vehicle.

• **October, Washington:** Testimony to airlines of basic criteria such as average engine failure rate.

• **Nov. 11, Montreal:** Discussion at testative standards with the International Civil Aviation Organization.

• **December, U.S. industry will get an entire draft proposal of the new regulations for full development by airlines and manufacturers in actual flight, followed by industry recommendations for revision of the draft proposal.**

• **May or June, 1953, European:** Conference of ICAO experts for final drafting of standards to be proposed for submission to member nations.

• **June, 1953:** U.S. industry will get a draft outline of CAA's proposed new regulations.

• **August, 1953, Washington:** Aeronautics Review by industry and government will think out any im-

portant differences that may still exist, and determine whether the new approach to safety regulation is ready for adoption. CAA and CAB will then study additional proposals and comments arising out of the conference.

• **Jan. 1, 1954:** Adoption of the new performance regulations is scheduled, turning industry and government are confident of their success.

The working group preparing these new standards at CAA, Steve Newbold, United Air Lines, Hugh Freeman, CAB, Jack Gamm, F. Mahabadi and Roy Miller (Carnegie), U.S. industry.

The new performance regulations will apply directly only to new transport design—passenger and cargo alike. But they also may affect operation of present transport types when the new standards, these changes in present regulations demand.

For example, the pilots may get more turbulence handling, acceleration, reducing gear weight on aircraft during test flights. The airlines may get more, larger, gross weight limits on two engine flights over high terrain, through application of the statistical approach in general. (Aviation Week, 11, p. 117.)

• **New Approach—Present regulations have developed personnel throughout air transport groups. Most decisions setting minimum safety standards by regulations have been a matter of judgment, modified by experience. Recent regulations have proved safe and reasonable, but large, but they are not to be constant.**

Now the U.S. and foreign aviation agencies are relying on new statistical approach to determine a basic statistical approach to aircraft risk.

• **Define safety:** Discussion of all three places from the average per-son's view of safety. The new approach is based on what is called a "normal curve." Somewhere near the subnormal end of that curve you want the line at "maximum acceptable" performance.

For instance, the most on order performance of a four-engine plane with two engines out may be determined as

#### Variables

Here is an example of the variables that will be incorporated in regulations to be proposed by the new CAA-CAB New Performance Working Group.

The power output of an engine has "standard deviation" of 3 to 3% from the best-made average performance of that type engine. That means that the average takeoff power is 2,300 hp. and there is 3% deviation.

60% of the engines will be within 2,160 and 2,600 hp.

90% will produce more than 2,160

hp; 90% will produce less than 2,600

hp; 25% will produce more than 2,376

hp; 25% will produce less than 2,024

hp; 81% will produce more than 2,239

hp; 91% will produce less than 2,011

hp.

a 100 ft. altitude climb. That is the worst you should ever expect, but you have to accept the fact that once in a million cases or so, bad storms could make performance even lower.

Next the question arises, how far down that average acceptable level should the average two-engine performance be required so that the "incidents" of maximum acceptable performance is so rare that we have a "safe" regulation?

Typically, thinking of the working group is that somewhere between one and ten accidents per 10 million flights is an acceptable standard mark. The criterion of safety is based on the fact that in the U.S. operates two-engine transports today the probability of both engines stopping or being feathered while in the air is about once in one to 10 million flights. We accept that level of risk. Therefore it is an acceptable and conservative starting point to define a standard standard of safety for all operations the group believes.

With the statistical approach in mind, here is how the standard is computed. • **The "Incident" rate:** An incident is defined in this new performance standard as not an accident. It is the probability of unacceptable performance occurring when you are not flying at a maximum design degree above the maximum standard.



The Pioneer Builder of  
Transport Helicopters

offers

UNUSUAL  
OPPORTUNITIES

for

ENGINEERING  
Designers & Draftsmen

with aircraft experience as  
Aeronautics, Controls, Electrical  
and Power Plant Installation.

ENGINEERS for  
Flight Test, Instrumentation  
and Structural Test

Also CHIEF of  
Experimental Flight Test

a degree in engineering with  
further knowledge of aircraft  
aeronautics, vibration,  
power plant and aerodynamics  
of helicopters. 5 to 8 years' ex-  
perience in flight test engineering,  
2 of which should be in  
flight testing helicopters.  
Experience as a helicopter pilot  
highly desirable but not  
necessary.

INDUSTRIAL ENGINEERS

Industrial engineering degree or  
the equivalent plus 2 to  
3 years' experience desired.

Send complete resume to Employment Office

PIASECKI  
Helicopter Corp.

MORTON, PA.

A Philadelphia Suburb  
Near Swarthmore

Setting the safety margins, having defined the acceptable incident rate, you must integrate the necessary margins above it to get the average performance you require (in order to hold accidents down to the acceptable frequency). What means you must compare the major variables that may reduce one plane's performance below the best average.

Take a four-engine plane with two engines out: average variables in its performance will be engine power, drag, aerodynamic efficiency, speed (pitch loading), instrument calibration, maintenance, landing error, gross weight, altitude, outside air temperature and humidity.

Each of these variables has a predictable frequency pattern, that can be computed into the form of a normal curve. Put them all together and you get one good frequency distribution in the form of a normal curve.

Knowing that curve, you can point off the maximum acceptable incident rate into the graph. Then you look up the curve to see peak and you have the "average" performance to guarantee so much that the acceptable frequency of substandard performance, in "incidents." You have a defined level of safety per flight statistically secured. Then you check it against actual test performance.

• **Aviation checking figures:** The airlines have voluntarily run flight tests to check the accuracy of the CAA-CAB working group's calculations. The findings reports indicate that first performance varies more than the standard prediction. The variable, too, will be constant with the findings.

Then comes the problem of drawing up regulations to meet at least the defined minimum safety level on every flight of every certified plane.

• **Applying the Three-Three rule:** You have the basic safety level defined and a formula for computing it, the first application is to an evaluation of new transport types. For a prototype aircraft is not a 3. Therefore, the new regulations will require that certification safety be so strict that average test conditions can be computed. And the airplane flight manual must show the average performance.

Then applying the flight manual to the new performance operating requirements, the new plane will operate with a predictable level of safety.

And all other aircraft types in certified flight will operate under the same defined safety requirements. The "best" rule in the new regulations has been set as low as the deviation curve that individual differences in performance will require no worse or special consideration.

Using the plane type's average performance as set forth in the manual,

the  
**ACCURACY**  
and  
**SPEED!**  
of

**LAPORTE**  
BROACHING

is achieving  
production  
miracles for  
manufacturers  
of

jet engines

Laporte is available  
directly from  
Laporte Broaching  
Machines, Tools, and  
Fixtures — and telling  
what day will accomplish  
in your plant to  
speed production and  
reduce costs

Ask for Bulletin  
AW-6



**LAPORTE**

MACHINE TOOL COMPANY  
WILMINGTON, MASS. U.S.A.  
THE WORLD'S LEADING MANUFACTURERS  
OF BROACHING MACHINES AND FIXTURES

## Jet Aircraft Equipment Opens

# New Fields of Endeavor for You

YOU ARE NEEDED NOW TO WORK ON.

**Turbine Engine Starters • Turbine Engine Fuel Controls  
Air-Cycle Refrigeration Units • Hydraulic Pumps  
Auxiliary Drives and Controls for Guided Missiles**

For many, many years Hamilton Standard personnel have been the most widely used name of jet aircraft equipment in the world. But with the advent of jet and turbo-prop engines, personnel are only one of many fields in which we use our modern facilities for research, design, development and manufacture.

Already we are setting the lead in the jet aircraft equipment field. This field presents a variety of fascinating challenges for the engineering mind.

To meet the new, and largest, research and development program in our 32 year history, we have just completed a \$10 million dollar power plant in Windsor Locks, Connecticut—in the heart of beautiful New England.

Our new location offers excellent living and working conditions. It is new enough to attract business executives.

And you must exert, to give you every cultural and recreational advantage. You are in a rural setting to offer country side comfort where you can work in peace and contentment.

We want men who would like to pioneer in new fields of endeavor—do creative engineering—enjoy freedom of decision and responsibility—and want to build a solid career with other young-adulthood men in an industry with a future.

Our employee benefits include group health, retirement, hospitalization and life insurance, retirement plan, paid vacations, and liberal sick leave policy. Our progressive program will provide ample opportunity for your future growth. Actually, our technical engineering staff has continuously grown since the beginning of the Hamilton Standard organization.

## IMMEDIATELY— WE NEED 97 EXPERIENCED ENGINEERS AND DESIGNERS

Design, development and test engineers with jet engine and aircraft experience will find full opportunity at Hamilton Standard because of the response of the jet equipment field. The company's extensive facilities—staff of specialists, jet aircraft high caliber men—in policy of conducting talent and the practice of quickly assigning responsibilities—and its confidence built of personnel from worldwide well-known institutions have been added for a successful future career.

Simply send your resume to the Recruiting Representative, Personnel Department, at the address listed below. It will be held in strict confidence.

## HAMILTON STANDARD

DIVISION OF UNITED AIRCRAFT CORPORATION  
WINDSOR LOCKS, CONN.

you often calculate the gross weight involved on any particular flight, just in order the present regulations, based on horsepower, thrust, wind, calculated weight and altitude.

Editor of New Standards—This December, the first year of the new regulations will be sent to industry for trial applications. Until then, the new job is integrating of major aircraft performance with the statistical analysis.

So far, the new climb requirements are sufficient about Approach and Landing as well. Yet to be completed, especially by two problems: the variable in the climb rate, the climb rate, and the determination of the engine fueling frequency in various segments of takeoff and climb-out.

## Executive Fleet

- Businessmen swing fast to using own planes.
- This trend opens new sales-service markets.

Day in and day out, more than 9,000 private airplanes of all sorts and shapes and comprising a great part of the postwar air transport revolution circle around the U.S. and beyond its borders.

This segment of the air fleet belongs to American business, from oil companies to telephone growth, and it is rapidly becoming the backbone of the potential of air in sales, service and maintenance. In fact the business plane has been responsible in a large measure for maintenance and growth of every aircraft servicing organization and is looked upon as a "main" market by maintenance and sales of aircraft equipment and field.

Growing fast—the rapid growth of this important new air transport field now is measured by the fact that only as recently as 1946 there were approximately 2,000 business planes, perhaps 500 being multi-engine and the remainder single-engine. By last year the multi-engine type had approximately tripled and the single-engine type more than quadrupled. The figure is much higher if another 7,500 planes are added that are used primarily for business and pleasure for pleasure.

The U.S. petroleum industry alone operates some 2,400 aircraft ranging from Cessna 170 and Beech Bonanzas up through the Cessna 441 and Douglas DC-4. Some of these planes go fast, and fast across the Atlantic to take executives and technicians to

the New York's all fields. One firm operates practically a domestic airline between New York and Washington, D.C., and its southeast all fields.

The day of the corporate "hangar space" is coming fast-as fast back as 1946, government statistics indicated that very little—0.11 percent—of professional flying input scheduled airline operating hours by 1.1 million hours. Utilization of business planes reportedly runs as high as 900 hours yearly and goes as steadily to 1,600 per year. Calculated on the basis of average passenger miles, executive transport last year flew more than 1 billion passenger miles. This work is steadily when recalled that the scheduled airlines reached the same figure only 11 years previously after many years of relative effort.

Glenn Fitch—What are the factors behind the rapid growth of business aircraft? Among the factors are: • Growth of U.S. airports. There are more than 4,000 airports in the country compared with approximately 2,300 in 1940, making it possible for the executive to find a place to stop and refuel without being scheduled airline. The whole 1 million-plus sq. mi. of this country are served by over 385 scheduled airline stops, including trunk, local and cargo services.

Flight schools—The postwar trend to locate new facilities in smaller communities away from major cities has forced executives to step up their traveling to keep operations moving. The airlines have offered incentives to meet their executive travel needs as well as to lower air fares.

• Favorable tax allowances. Companies can depreciate up to 25% of its plane the first year and amortization allowed by the government is even more favorable if a used plane is purchased.

Profit in owning a company plane are sizable. Unlike the rental fee, the company doesn't fix the number of passengers and cargo and also makes a profit that the plane is operated as many revenue dollars to be balanced against its operating costs. Cash when plane costs are taken against the value, permitting people to double or triple their corporate or bank assets on competition does not present the same show its profitable aspects.

These manufacturers and sellers have hundreds of our customers of general use of the business plane. So the sales manager of one manufacturer "In approaching a businessman, we no longer stress the mechanical features of our machines. We stress the value about them but we don't want what is under the hood of the automobile. But when we show him what the airplane will do for him, our selling job is over."

## Domestic Trunkline Traffic

	Jan.-June 1952	% Change from a year ago
Number of passengers	30,624,428	up 9%
Passenger miles	3,849,191,804	up 17%
Mail ton-miles	18,778,817	up 17%
Express ton-miles	33,161,248	down 17%
Freight ton-miles	54,007,065	up 8%
Total ton-miles	68,168,120	up 15%

## Airlines '52 Volume Up Sharply

The scheduled domestic airlines will last 1952 year volume rise more than, according to a forecast by the Economic Research division of Air Transport Association.

ATA forecasts domestic passenger miles will grow 14% to 11,686,000,000, and ton-miles up 84% to 75,742,000, cargo ton-miles up 9% to 31,700,000, and freight ton-miles up 8% to 108,000,000 ton-miles. The 1.6 million ton-miles increase in express will be accompanied by a 1.6 million ton-miles increase in freight.

• Other Cargo—Total traffic the first half grew 15% over a year ago to 68,168,120 ton-miles. The second half of the year will be up slightly (68,710,000), but only 13% higher than a year ago.

ATA is not predicting international airline business, but reports that total volume the first half of the year is up 14% over a year ago to 17,040,000 ton-miles. Scheduled revenue passenger miles rose up 17% to 1,189,414,000, U.S. mail is up 7% to 18,778,817 ton-miles.

657,534 ton-miles, foreign mail has grown 8% to 2,044,135 ton-miles, cargo (freight and express) is up 74% to 31,700,000 ton-miles.

Average passenger flight has increased greatly this year as both domestic and foreign traffic. Both are up about 9%—passenger flights to 1,300 mi., domestic to 555 mi.

Local Lines—Local airline volume business to be this year has followed the pattern of the trunk lines. But they haven't gained as much, possibly because they haven't been able to buy new equipment to increase schedules at the same rate as the trunk.

Local lines' total revenue ton-miles the first half are up 5% to 16,177,554 ton-miles. The second half is up 5% to 16,200,000, and is up 17% to 423,772 ton-miles, express down 14% to 425,772, and freight up 18% to 14,515,772 ton-miles.

While the local line's revenue ton-miles have grown only 5% over last year, their traffic is nearly double the 1950 volume.



## CABIN CONDITIONING FLEET GROWS

United Air Lines' DC-6s give a ground air conditioning treatment from one of five large mobile units mounted on trucks by the carrier to supplement a smaller weather shield in service. Each conditioner can de-

liver 2,000 cu. ft. of chilled air from Chrysler Air-Trol units or 150,000 cu. ft. from the Street-Winner liquid ammonia. Truck body is by Fairbank Tank Co., 34-man crews are interviewed hourly.









## SO THEY TELL US

## Air War

One of the staffing implications, looking at the air war in Korea, is the fact that the Russians have two jet fighters in the new MiG-15 interceptors, and the Type 15, with the new engine, is just as tough as the MiG-15." Western Week's *Red Jeep* reports from the Japan Korea war zone: "Velocity fighter pilots of the 4th and 5th Fighter-Interceptor Wings are it's as fast and maneuverable as the MiG, and it holds together as well as the newer MiGs which carry the head-up and tail sections." The new engine has up speed

Many of our recent victories over Red fighters may be attributed to a better version of the Siberian Jaeger, one of a few of which are now in Korea. But in the final analysis, the major advantage which the U.S. fighter has over the Russian is the complete exploitation of the Siberian's capabilities. Jaeger units, American pilots have wing over, master of performance out of the surprise. They feel that Red pilots have not done the same with the

The EPPF has been put through 34 Gophers and three hamsters. Jones says the first one removed was led by the Royal Canadian Air Force. Silver wings in England. The bird pecked in a fight of four, making a pass it a cloud went into the cloud on its pillow. The plane registered close to 100 G. Not long ago Cal Francis Gopher pulled the case G load, according to pilots of the 13th Wing, which is composed in Korea. Both planes were pulled out of use and were definitely stressed out. But both have come

What the Communists are doing with these so-called left parties American air commanders (Jung writes: "For a long time, MG. Miles was the Red's training course. There have been lots, signs of training course lately. And still there is no real sign of having the Red on effort in the Korean War. Our possible and not incredible explanation is that the Red air commander at Suifu in Ta Tung Kow in Manchuria has not met the Red air command commander in North Korea."

[illegible]

This story is substantiated by Leachman: "An F-4M pilot came back from a bombing run over Laos and told me that he had seen a plane that looked like a C-47. He said it was flying low and fast, and he thought it was a C-47. I said, 'That's interesting. I've never heard of a C-47 being used as a bomber before.' He said, 'I don't know, but I saw it.'"

Lockheed service representatives in Kunming reported that F-50 fighter-bombers are taking off on combat missions carrying full tip tanks and two LOB bombs. Pilots say the plane handlers overhead were: "Waterlooed" (spelled), not NATO, is still an inside job.

STRICTLY PERSONAL

### Maxine He's Club on Houston Street

On Ben Lee reports that the well known medical columnist, Fred Orshan, appeared on an AA ship from Washington, called an American hotel owner who

The agent agreed reluctantly that he might if Ottoman could furnish proper identification.

During the show, he was badly shaken by all the way. Obama produced a small membership card signed by AA President C. R. Smith identifying Obama as "Flagship Member" and thereby entitled to a seat, wherever.

The agent studied the card for some time, then dropped it on the counter and walked away. "What's so special?"

Others finally got his money by producing his driver's license issued by a distant state.

### Keywords

McGraw Hill's search people sent us e-mail letters to a couple of hundred business Web subscribers to get the opinion on various departments of the magazine. We were surprised how many letters in return for Search Personal. So we drew subscribers were under the question. What do you think about Avast? Good? Not good enough?

"Sometimes contains pretty personal notes which are necessary (Strictly Confidential)"

Despite the "no, the grape prices are not going to rise" message, we still see the same old, same old. The wine, incidentally made for C&A, is a masterpiece.

Wardlaw &amp; Cunningham

Plot: "Domestic" 1 hour  
 Tower: "Chained Girl" 1 hour  
 —Dr. Harold Green

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26

**LaGuardia's Good Neighbor**  
 During all the hoopla over LaGuardia's name, we asked Pete Bialos at LaGuardia's airport about his own small business, and how they were doing in Queens. Buckle up!

Fine says a trucking was running full blast with 50 little planes on the field. Spence Smith, master domo there, said he's had no serious complaints from his neighbors. Although one state citizen did call up an attorney to punch his name if he didn't stop the noise. Nothing was happened.

But on the other side of the picture, taken the same time as the complaint, women came strolling across the field with two youngsters. Said the land in a few apartment project time in the bid, I hadn't know there was an apartment yard also discovered it on this side with the job.

## ADVERTISERS IN THIS ISSUE

ATHLETICS WEEK—SEPTEMBER 8, 1992

30	SHUTTLE TECHNOLOGICAL CORP.	30	STANDARD ELECTRIC SUPPLY CORP.
31	SHUTTLE INDUSTRIES CORP.	31	STANDARD ELECTRIC SUPPLY CORP.
32	SHUTTLE INDUSTRIES CORP.	32	STANDARD ELECTRIC SUPPLY CORP.
33	SHUTTLE INDUSTRIES CORP.	33	STANDARD ELECTRIC SUPPLY CORP.
34	SHUTTLE INDUSTRIES CORP.	34	STANDARD ELECTRIC SUPPLY CORP.
35	SHUTTLE INDUSTRIES CORP.	35	STANDARD ELECTRIC SUPPLY CORP.
36	SHUTTLE INDUSTRIES CORP.	36	STANDARD ELECTRIC SUPPLY CORP.
37	SHUTTLE INDUSTRIES CORP.	37	STANDARD ELECTRIC SUPPLY CORP.
38	SHUTTLE INDUSTRIES CORP.	38	STANDARD ELECTRIC SUPPLY CORP.
39	SHUTTLE INDUSTRIES CORP.	39	STANDARD ELECTRIC SUPPLY CORP.
40	SHUTTLE INDUSTRIES CORP.	40	STANDARD ELECTRIC SUPPLY CORP.
41	SHUTTLE INDUSTRIES CORP.	41	STANDARD ELECTRIC SUPPLY CORP.
42	SHUTTLE INDUSTRIES CORP.	42	STANDARD ELECTRIC SUPPLY CORP.
43	SHUTTLE INDUSTRIES CORP.	43	STANDARD ELECTRIC SUPPLY CORP.
44	SHUTTLE INDUSTRIES CORP.	44	STANDARD ELECTRIC SUPPLY CORP.
45	SHUTTLE INDUSTRIES CORP.	45	STANDARD ELECTRIC SUPPLY CORP.
46	SHUTTLE INDUSTRIES CORP.	46	STANDARD ELECTRIC SUPPLY CORP.
47	SHUTTLE INDUSTRIES CORP.	47	STANDARD ELECTRIC SUPPLY CORP.
48	SHUTTLE INDUSTRIES CORP.	48	STANDARD ELECTRIC SUPPLY CORP.
49	SHUTTLE INDUSTRIES CORP.	49	STANDARD ELECTRIC SUPPLY CORP.
50	SHUTTLE INDUSTRIES CORP.	50	STANDARD ELECTRIC SUPPLY CORP.

Where to Buy  
PRODUCTS • SERVICES  
ALLSOURCES

## CENTRIFUGAL CASTINGS...

*Best*  
for most castings  
*Best*  
to prevent gas and  
liquid leaks

For details, write for booklet,  
American Iron & Steel Institute  
Box 100, Chicago, Ill.

## Rusco Seat Belts Put Safety First...



Consider these 6 outstanding  
Features of Top-L-Lok Seat Belts:

1. *Amant, passion action...* to look so much simply these love
2. *Dependability...* Positive Toggle Grip—Moore C.A.S. Toys
3. *Symphony...* Instantaneous adjustment and relief
4. *Lightness...* 3P don't usually weigh less than a pound
5. *Full-leaf plastic top...* nothing to pull off, nothing to buy
6. *Shock resistance...* no treadmills or pings

That Encon Belt is considered "standard" for light planes. Other Encon belts for every requirement. See your electrical supply house or our nearest office.



THE RUSSELL MANUFACTURING CO.  
MIDDLETOWN, CONN.  
New York • Chicago • Detroit • San Francisco

## BUSINESS FLYING



PUBLISHED MONTHLY

32 PAGES

The only magazine that reaches aviation's fastest growing market — the **BUSINESSMAN** — the **FARMER** — who uses his plane as a business tool.

Send today for your  
**FREE COPY**  
and all retail stations on  
this rich select market.

## BUSINESS FLYING

for Commerce and Agriculture  
2032 Rodden Ave., Madison 1, Wis.

## A Report to You

A SAFETY EDITOR—AVIATION WEEK has named Alexander McCleary as Aviation Editor. Tim well-known staff member, who joined our production magazine, *Aviation News*, in 1943, will concentrate on up-to-the-minute coverage of safety developments in both manufacturing and operation. We believe this is the first time any publication in the aviation field has ever given such recognition and emphasis to the vital subject of safety. *Aviation Week* has given special attention to safety subjects since it was established in 1947, as did *Aviation News* before it, and we were early advocates on our editorial page of Jerome Lederer's proposal for a Flight Safety Foundation, before it was set up. *Aviation Week* also sponsors annual awards, selected and given by the Flight Safety Foundation to several individuals deemed to have contributed the most to air safety in the previous year. With this appointment, we pledge even better news and editorial coverage to air safety than we have been able to offer you in the past.

FARNBOROUGH COVERAGE—*AVIATION WEEK* sent its executive editor, Robert Holt, and its engineering editor, David Anderson, to England to cover the annual exhibition of the Society of British Aircraft Constructors at Farnborough. Their efforts are being repaid by our regular British correspondent, Ned McKel, and *Aviation Week's* publisher, Robert Rogers, also is on the scene. This unprecedented American coverage of the world's most important aeronautical meeting will bring you readers a complete report of current British and Continental aviation in this and coming issues of *Aviation Week*.

ABOUT CONTRASTS—We are often asked why *Aviation Week* does not enter editorial or writing contests. Without implying criticism of any such effort, let us state it has been to write and edit this magazine for you readers. We cannot fix our eyes on contest judges or prizes, present or future. We think you know most about what you want and value in aviation writing.

You readers vote on us every time you enter a subscription or renew one. You must pay heed only for your subscription because, unlike some of our competitors, we don't give a magazine away for free. Our circulation is paid, and it is audited by the Audit Bureau of Circulations.

Yet our circulation now leads that of all other non-news papers in the aviation field by a hefty margin, although *Aviation Week* in its present form is just five years old.

Our advertising sales department was this high readership is paying off with them too. And, obviously, as we attract more ads, the editorial department gets a better break for more new staff members have added several editors the past year in New York, Washington, Dayton, and Los Angeles, more traveling more long distance phone calls, more telegrams and more airmail and trans-Pacific cables, more correspondents to bring you more news—and faster—than ever before.

No, we hope to keep winning the most important contest of all—the contest for your continued interest and readership.

P.S.—We have other improvements in *AVIATION WEEK* coming up too. In the meantime, remember that we are always glad to have your letters, telling us what you do or don't like about *Aviation Week* and how we can improve it to help you.

## Halting the March of Complexity

A constantly increasing number of important military developments militates and laboriously presents abundant proof that some top Air Force officials are concerned enough with the problem of aircraft and equipment complexity to order a thorough study of the problem.

Obviously, any noticeable slowdown in this feature's pace toward complexity is out of the question, since it is the important fact is that increasing attention is being given to upper echelons in the need to apply the brakes.

The Boeing bomber bears frequent plumes—especially from the theorists in the ivory towers—that amplifies both in civil control and automatic navigation, for example, are enormous dangers in an age of increasing flight, missile, atomic power and a growing of inter-sterile space activities.

Yet in the development lab we find one extremely complex system that may, weigh a thousand pounds less when it is installed on combat craft five years from now than its predecessor model weighs on current planes. And its maintenance will be far easier by use of push-pull sub-units. It still will do the work of three to five men, and do it better than equipment now being in combat. Some simplification was possible.

The theorists today are tackling problems that are literally out of this world. They use the aid of the design, development and maintenance engineers, as we must always expect. But it is on these latter—and the government buyers—that we must hang much of the responsibility for simplification. The time has come when extra gadgetry can be permitted to substitute for simplicity—and thinking.

## Still Selling Aviation Short

CAA has revised a 1948 forecast that 20 million domestic passengers would be flying each year by 1955. The revision was necessary because that figure was exceeded in 1951!

CAA now decides that domestic airlines will be carrying 40 million passengers a year by 1960, about twice as many as last year.

Even the airlines' own trade association has had to revise its predictions several times.

These quick changes seem to bear out our contention on this page for several years—that the industry and government have conservatively and persistently sold aviation's future short. Both are still doing it.

—Robert H. Wood

## HOW THE HUFFORD INSURES FASTER, SAFER STRAIGHTENING

Ram inches to .010"

Stops automatically

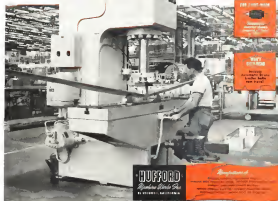
Overcomes Overbending



Here's the secret to faster, easier, safer straightening! Hufford's Automatic Stroke Limiter takes out the guesswork—gives operators a sure control over ram travel!

Merely set the stops to any desired ram descent by rotating the graduated handwheel. Ram comes to a complete halt automatically at any desired extension. Inching with the same control applies the final degree of correction. No over-travel, no over-correcting of work pieces, no wasted time! So accurate is the control, the ram will repeat indefinitely with split-finger precision.

Applying the final correction to a wing spar at the indicated automatic point

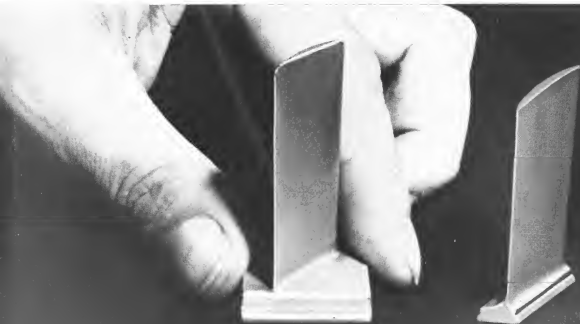


**HUFFORD**  
Precision Hydraulic Press  
12100 E. 10th Ave., Denver, Colorado

*Registered*  
Hufford Hydraulic Presses are built to meet the exacting requirements of the aircraft industry. They are built to last and to give you the most efficient straightening operation possible.



# Which One Will Save a Million Dollars?



This? ↑ or This? ↑

Three years in the making, the fabricated jet engine compressor stator blade (left) promises to save the armed forces not just one million, but millions of dollars annually in jet engine costs, compared with the forged blade (right). This new G-E development will cut manufacturing cost in half and save over a third in critical materials. Military approval has been received for the use of fabricated blades in the General Electric J47-GE-23 which powers the Boeing B-47 Stratojet bomber. And G.E., through the United States Air Force, is sharing the process with other turbojet manufacturers.

The blades are rolled in long strips, contoured to the proper air foil, and cut to desired length. Each blade is then welded into a separate base which fills the same

area as the "blade ring" used with forged blades. Thus the ring and an expensive manufacturing and assembly process have been eliminated.

Endurance tests on two engines equipped with the fabricated blades proved them just as efficient as forged blades. The base provides greater resistance to vibration due to uneven airflow through the compressor. Damage caused by foreign objects entering the compressor is minimized because the new blade is fastened much more strongly to the casing.

A product of G-E research at the Thomson Laboratory in Lynn, Mass., this new method of manufacturing stator blades is another of the many ways in which G.E.'s constant pioneering contributes to the advancement of aviation. General Electric, Schenectady 5, N.Y.

210-29

*You can put your confidence in—*

GENERAL  ELECTRIC